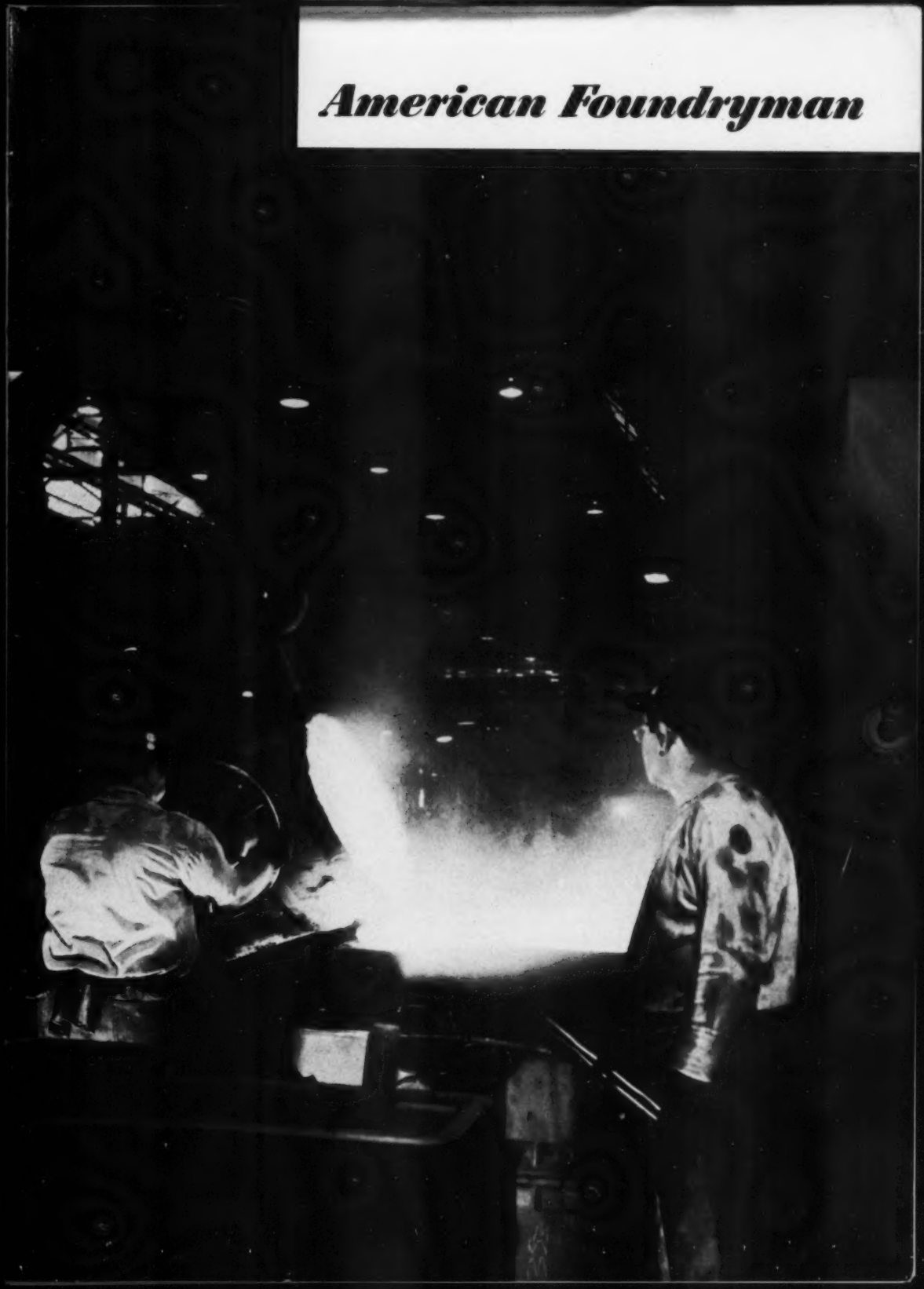
American Foundryman



Lectromelt*

FURNACES FOR MELTING, REFINING, SMELTING AND REDUCTION

35 years ago, the first Moore Rapid Lectromelt Furnace was put to work, setting the pace which established these furnaces as leaders in industry. Bold thinking throughout the years has maintained that position and, today, Lectromelt Furnaces are first choice internationally for all types of melting, refining, smelting and reduction.

From the automatic controls that guide the operation of a Lectromelt Furnace to its massive shell, Lectromelt Furnaces are built as production tools. Assembled and mechanically operated on the erection floor at Pittsburgh, they go together faster in your plant, and you get into production with minimum delay.

Lectromelt Furnaces offer you rapid top-charging, high-speed melting, accurate control of quality and low-cost operation. They give long, trouble-free service and correspondingly low upkeep costs. We sell mighty few replacement parts; evidence of their durability.

Catalog No. 8 describes iron and steel melting and refining work. For a free copy, write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Brassoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

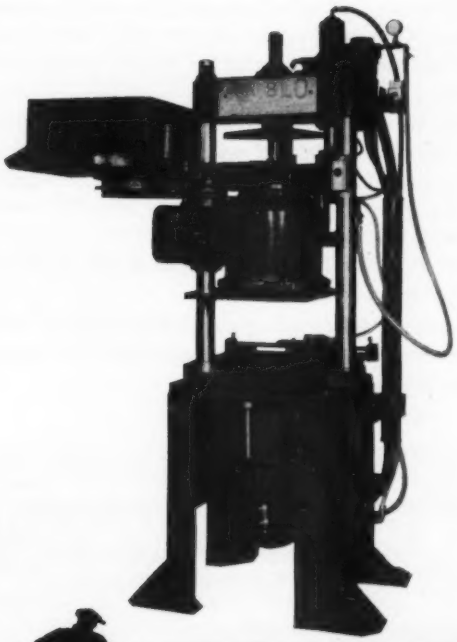
*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID Lectromelt

as revolutionary as the FIRST CORE BLOWER

THE PULSATOR

MODEL SAN-BLO



Throngs at the Foundry Show saw this astounding machine perform the unheard-of feat of blowing open core boxes (wood and metal) *without vents or special rigging of any kind.* These boxes were "right off the bench"—not made for blowing—but the PULSATOR blew them!

If you did not see this amazing performance, and have wooden core boxes you'd like to blow, write us for complete information.

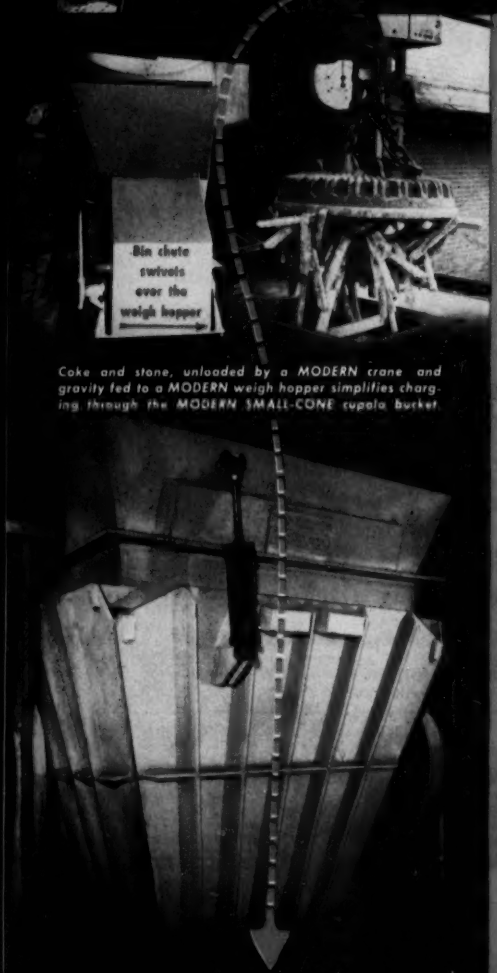
The FEDERAL FOUNDRY SUPPLY Company

4600 EAST 71st STREET, CLEVELAND 5, OHIO

NO NONFERROUS POURING TOO SMALL

No Steel Mill Foundry Charger

TOO LARGE . . .



Coke and stone, unloaded by a MODERN crane and gravity fed to a MODERN weigh hopper simplifies charging through the MODERN SMALL-CONE cupola bucket.

WORKING TOGETHER with practical foundrymen MODERN engineers pioneered mechanical pouring in the small foundry. Then all down through the years for more than thirty years one outstanding achievement blazed the way for another and a tougher job. . . .

Typical of the range and flexibility of today's mechanical charging is this 100% MODERN system shown in operation here. Coke and stone, from gondola cars, flows to cupolas without interruption. Every operation from MODERN yard-crane to SMALL-CONE SIDE-DISCHARGING bucket has been synchronized to reduce handling cost and further boost the temperature of metal poured.

More complete details will be mailed on request. Just return the coupon for catalogs or free loan of MODERN sound, color, motion, picture films. . . . .

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

MODERN EQUIPMENT COMPANY
Dept. AF-5, Port Washington, Wisconsin
Without cost or obligation mail:
Catalog on metal pouring systems ☐
Cupolas and cupola chargers 147A ☐
Cranes and monorail systems 150 ☐
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City..... **State**.....
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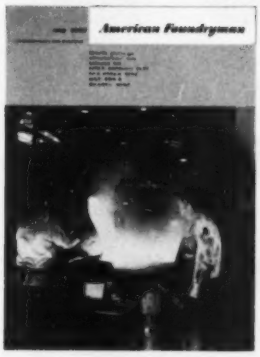
American Foundryman

May 1952 / *Volume 21 • Number 5*

Official Publication of the American Foundrymen's Society



Pouring a large diesel engine block on a mold conveyor at Caterpillar Tractor Co., Peoria, Ill. Man at right removed sand core plug from third sprue as metal filled T-shaped pouring box. Wires in center foreground are connected to an alarm which sounds when mold cavity is full, preventing waste of 200 to 300 lb of iron in runner box. Pouring station has side exhaust hold for comfort of pouring crew and nearby workmen.

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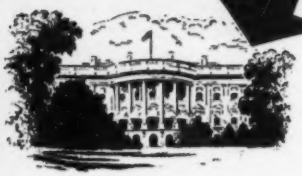
For over 10 years a steady user of...

BS&B Foundry Flasks

Pictured above ...the cope and drag sections of BS&B medium weight flasks made up and ready for placing preparatory to casting.

Dampers For The White House



The E. L. LeBaron Foundry Company, Brockton, Massachusetts, has placed 27 fireplace dampers in the entirely renovated executive mansion in Washington, D. C. BS&B Foundry Flasks were used in casting these patented dampers. LeBaron makes castings of their own, and for outside customers. This requires a variety of flask sizes adaptable to jobbing work. For over 10 years BS&B has supplied LeBaron with new sizes and replacements. While BS&B flasks are designed to permit customers interchanging them with any other type of flasks, already in use, LeBaron is now replacing older equipment with BS&B flasks . . . because BS&B flasks have proved satisfactory in overall operation and maintenance costs.

Designed and Fabricated to Eliminate Excessive maintenance . . . only BS&B heavy duty foundry flasks combine these features to make it a BS&B exclusive—welding of bearing strips both inside and out . . . cast steel trunnions . . . cast steel pin lugs and clamp lugs. Tailor made to your requirements.

We can deliver without long waiting periods, light, medium or heavy duty flasks—round, square and rectangular shapes. Any type of pin and bushing arrangement can be supplied to meet customer specifications.

Write for FREE BS&B Foundry Flask Handbook

A handy catalog and useful foundryman's "bible" . . . includes easy-to-order system.

Foundry Flask Division Dept. 7-AQ5

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BLACK, SIVALLS & BRYSON, INC.

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This combination increased Lining Life

4 FULL WEEKS

on our Arc Type Electric Furnaces!

CASE HISTORY #135

We produce semi-steel cam shafts of an extremely critical analysis. Formerly, we used 13½" silica linings in our electric furnaces and had to re-line them weekly; sometimes shutting them down before a week's run because the linings would go out.

Now we have linings of HTR Refractory Brick and HTR Bonding Cement that are running 4 to 5 weeks and instead of 13½" linings, we use a 9" HTR Lining. This gives us increased melting capacity . . . tremendous labor savings . . . greatly reduced down time!

In addition, we've put bottoms of HTR Refractory Brick, Bonding Cement and HTR Electric Furnace Bottom Mix in our units. These bottoms have withstood a year's running without evidence of deterioration or reduction in thickness.

Specify HTR for Best Results BY FAR!

The ability to withstand severe "burning in" . . . producing surfaces that are slag-resisting, abrasion-retarding . . . these are the essential properties of HY-TEMP REFRACTO Bricks, Bonding Cement and Bottom Mix that will greatly reduce your electric arc melting costs. Case History No. 135 is only one of many factual instances in which HY-TEMP REFRACTO MATERIALS have turned re-lining time into production time . . . reduced lining thickness and transformed it into additional melting area. Easily applied . . . easily inventoried . . . simple to maintain . . . HTR MATERIALS are your answer to efficient, economical electric arc melting production.

CHECK THIS PERFORMANCE SCORE
Based on Facts in Case History #135

	Previous Material	HTR Material
Lining Thickness	13½"	9"
Re-Lining Time in Year of Running	Average of 43-2/3 Days	Average of 12 Days
Bottom Thickness	18"	13"
Bottom Life	3 Months	On 2nd Year

Information on HTR REFRACTORY MATERIALS, specifically formulated for use in electric arc melting, is available on request. HTR Service Engineers will advise you without obligation.

HTR HY-TEMP REFRACTO MATERIALS

NATIONAL FOUNDRY SAND CO.

BRICKS • BONDING CEMENTS • ELECTRIC FURNACE LININGS AND BOTTOMS

EXECUTIVE OFFICES 1700 WEST GRAND BLVD., DETROIT, MICHIGAN

for lower cost ladle graphitizing
for effective chill reduction
for accurate hardness control
for better machinability

SPECIFY

No.8

The most powerful ladle graphitizer

Proven in use by thousands of foundries

Treat gray iron effectively for less than 10 cents per ton of castings! One ounce per 100 lbs. of iron will usually do the job.

WRITE FOR OUR ENGINEERING BULLETIN NO. 2

GRAPHITIZE WITH No. 8

170

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

How You Can Get Brass Ingot ...and Get More Out of What You Get

It's simple. Just turn in scrap. The more scrap smelted, the more brass ingot available. The more available, the more you get.

Even so, you may not get all you want, or exactly the alloy you want all the time. Therefore, Federated offers you an extra service to get more out of what you do get.

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Remember your Federated salesman. He's your representative at non-ferrous metals headquarters.

Federated Metals Division

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Better All The Way

WITH NVX IN THE GREEN SAND FACING

These unretouched pictures (Courtesy Farrell-Cheek Steel Company, Sandusky, Ohio) tell a big story of what a little Hercules NVX in your green sand facing can do to give you better molds and better castings.

NVX improves sand flowability and workability—means more firmly rammed molds. Even in this deep-pocketed pattern, there were no peening or ramming problems.

NVX gives good draw. It also keeps the sand from drying out—means a better first finish, less time spent in final finishing. Note the smooth surfaces on this massive steel casting, shown as it came from the mold.

These results are typical of those you can get on castings of any size or shape. And remember that your green sand facing will need no more than one-half of one per cent by weight of Hercules NVX.

Send for technical data. 100-lb. lots of NVX for testing are available from Hercules at the 1000-lb. price.

HERCULES POWDER COMPANY
INCORPORATED
Naval Stores Dept., 912 Market St., Wilmington 99, Del.

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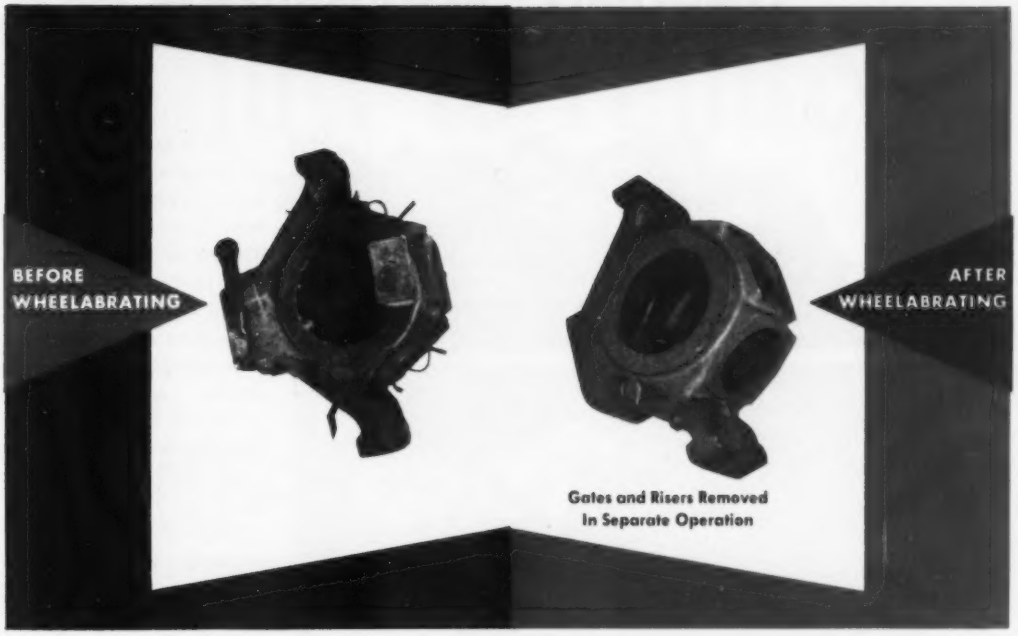
FROM PATTERN...

TO MOLD...

TO CASTING...

SAVE TIME AND MONEY WITH *HERCULES* NVX



cleaning time cut 15,000 man hours yearly

WITH WHEELABRATOR® AIRLESS BLAST CLEANING

SUPERIOR FOUNDRY, INC. OF CLEVELAND, OHIO, reduced cleaning time from 96 to 40 man hours daily by installing a Wheelabrator Monorail Cabinet which handles all work formerly done by 3 tumbling mills and 2 blast tables.

INVESTMENT RETURNS 50% YEARLY. Half the cost of this equipment was returned the first year through savings effected in manpower, reduced maintenance, decreased storage space, power costs and increased cleaning room efficiency.

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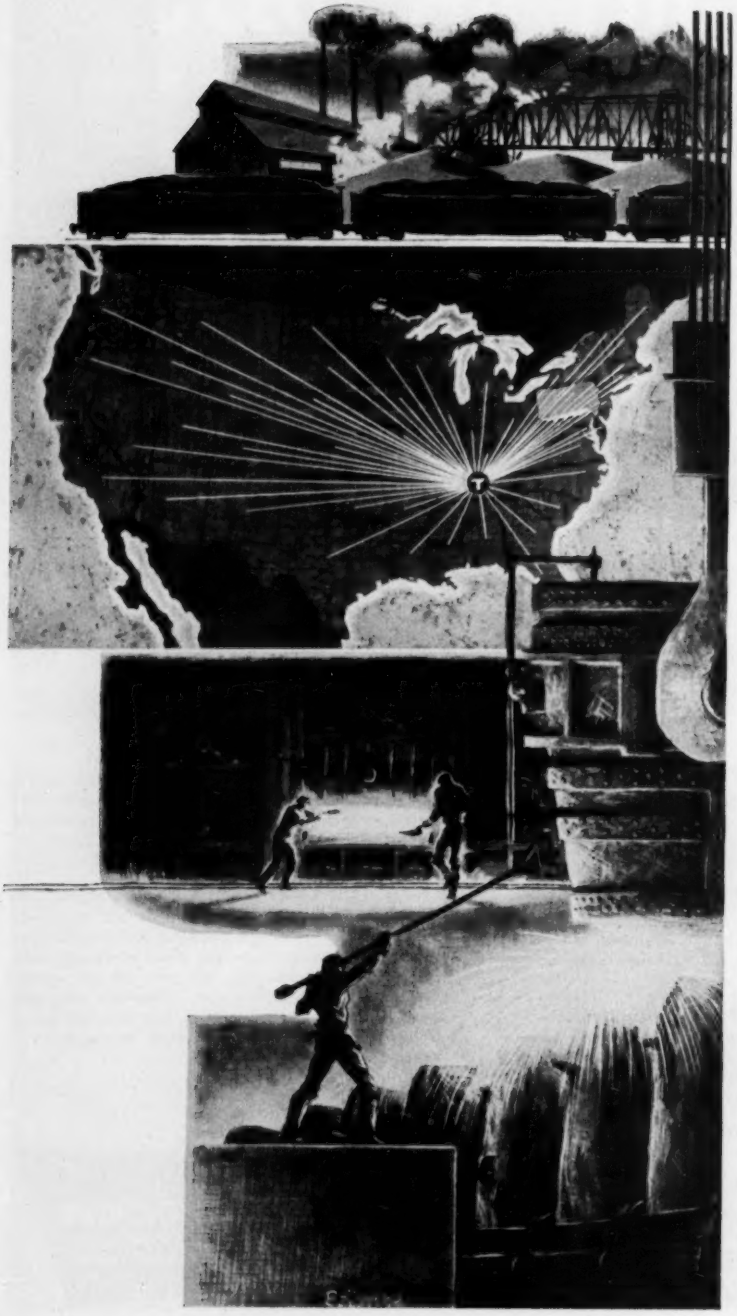
WHEELABRATOR — The perfected airless centrifugal blast unit pioneered by *American*. Slashes cost and cleaning time. Conserves power, labor, space. Cleaning perfection results in longer tool life, faster machining and grinding, easier inspection.

American
WHEELABRATOR & EQUIPMENT CORP.
630 S. Byrkit St., Mishawaka, Indiana

WORLD'S LARGEST BUILDER OF AIRLESS BLAST CLEANING EQUIPMENT

THERE'S A TOUCH OF TENNESSEE IN PENNSYLVANIA STEEL



Steel is as much a part of the Pennsylvania story as Benjamin Franklin or William Penn. It is the hard core of a strong America whether it is made in Pittsburgh, Birmingham, Chicago or St. Louis. Wherever it's made, steel and castings need Tennessee Products... pig iron and coke as well as ferro alloys. To Pennsylvania and across the nation, TENNESSEE also ships Methanol for denaturing alcohol, Sodium Benzoate for food processing and many other products essential to industry and agriculture.

Pennsylvania's industry is a good customer of Tennessee Products as is industry in all the 48 states. That's why TENNESSEE is known from Coast to Coast as an industry serving all industry.

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Corporation
NASHVILLE, TENNESSEE

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how to reduce RAM-OFFS

LINK-BELT Sand Revivifiers and Sep-Aerators assure flowability . . . cut sand preparation costs by thorough aeration

Here's a simple, economical way to cut down scrap. Link-Belt Sand Revivifier gives you an aerated, fluffy sand with corresponding drop in temperature, that flows easily around every corner of the pattern . . . rams to a uniform density every time.

In non-ferrous foundries, the Link-Belt Sep-Aerator removes metallic shot by centrifugal action. Both are well engineered, standardized units built for many years of service.

For full information, call the Link-Belt office near you. A foundry specialist will be glad to work with you or your consultants to help you increase production in your foundry.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal cities.

LINK-BELT

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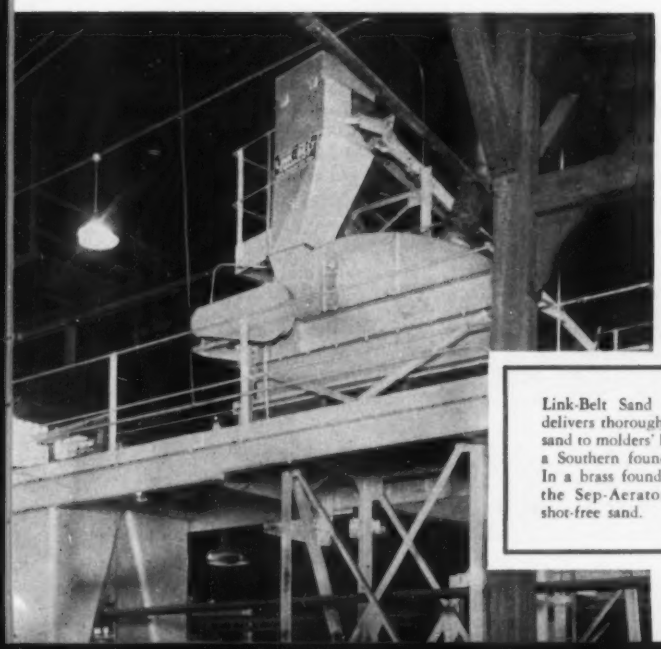
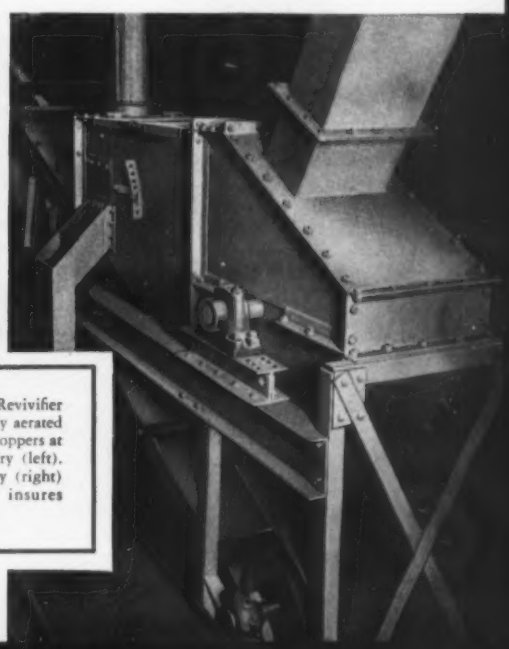
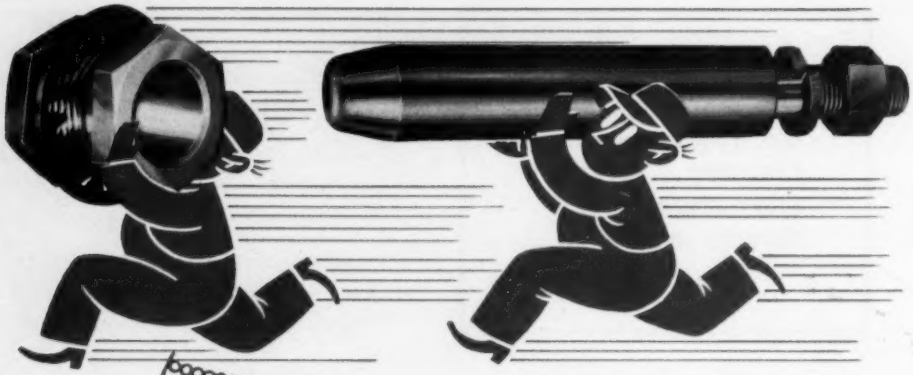
12,487





Link-Belt Sand Revivifier delivers thoroughly aerated sand to molders' hoppers at a Southern foundry (left). In a brass foundry (right) the Sep-Aerator insures shot-free sand.



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THREADED FLASK PINS AND BUSHINGS

Universal Flask Pins and Bushings save precious minutes of production time because they assure instant, accurate alignment of cope and drag. And they also save down-time because, being heat-treated and precision ground from fine quality steels, they stand up under rough treatment and give long, satisfactory service. Universal threaded series Flask Pins and Bushings are used in steel, aluminum, magnesium or other light metal flasks. Bushings are available in both the round and elongated types; pins in both round and hexagonal types. Universal carries a complete line of sizes of its threaded series as well as its taper and plain series Pins and Bushings as regular stock items. For further information write to the Universal Warehouse nearest you — 1060 Broad St., Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

160

PROGRESS REPORTS FAVOR EXTENDED USE OF NATIONAL CARBON IN BLAST FURNACES

TRADE-MARK

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
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District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

WHY BUY THIS ITEM?

It gives you *double the usable light!*
No metal can to *leak or corrode!*
It can't *stick, swell or jam!*
It delivers the *whitest, brightest light!*

It's the "Eveready" No. 1050 flashlight battery, made with the zinc electrode inside a carbon jacket – just the reverse of every other battery on the market.

Test it and . . . you always buy it!

● The future of "National" carbon as a preferred material for blast furnace linings is definitely assured by the mounting evidence of its extra long life in hearths and, more recently, in side walls all the way up to the mantle.

Already, indications are that, as carbon goes *up* the furnace, operating costs come *down*. Fewer shut-downs, more uniform casts are consistently being obtained in existing installations. And increased capacity can be expected to result from the use of thinner wall sections, made possible by this ideal furnace-lining material.

Furnace operators are urged to keep their eyes on carbon and on the growing body of data covering its use in modern, high-tonnage-life furnaces.

OTHER NATIONAL CARBON PRODUCTS

BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • SKIMMER BLOCKS • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS • TANK HEATERS

MODERNIZE WITH A MULTI-WASH

DUST, SMOKE AND FUME REMOVAL SYSTEM

This self-liquidating improvement can step you up to new production records

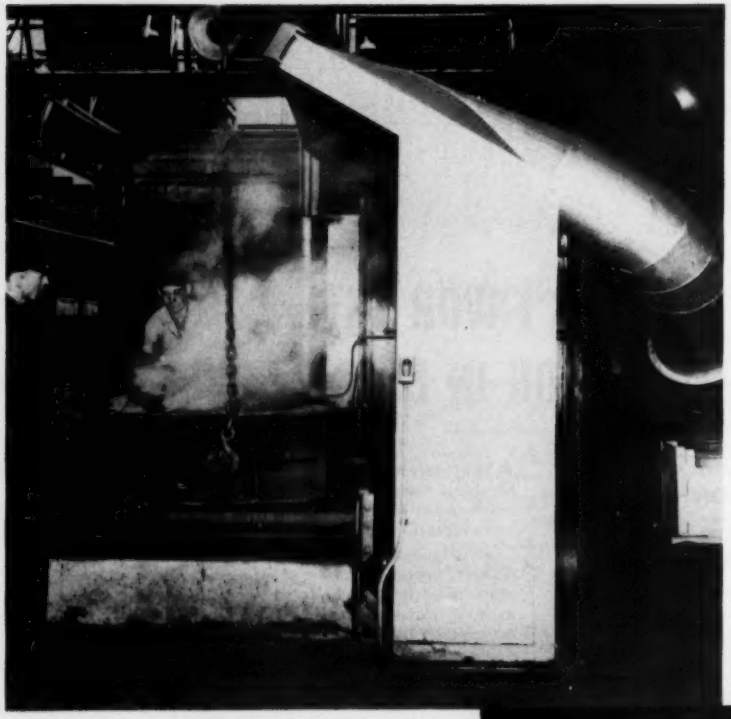
Today, more than ever, conditions make it imperative to increase efficiency in foundry operation in order to meet new production schedules and maintain a reasonable profit margin.

Many foundries have made substantial gains in both respects by modernizing with Multi-Wash. Replacing contaminated air with fresh, clean outside air has cut down turn-over of production personnel and given a noticeable lift to efficiency of operation. This naturally reflects in increased sales and profits.

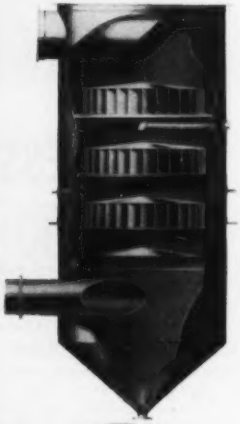
Why not consider this means of meeting competition? A Multi-Wash dust collecting system can give you *clean air everywhere.*

Call your local Schneible engineer or write direct for further information.

CLAUDE B. SCHNEIBLE COMPANY
P. O. Box 81, North End Station
Detroit 2, Michigan



Model JC Collector—For most shakeouts and sand preparation systems. Model IC Collector—For hot or dry shakeouts and most cleaning room applications. Model HC Collector—For highest collecting efficiency of extremely fine materials. *All models are made in ranges from 1000-36,000 c.f.m.*



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PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

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SERVING.....the Non-Ferrous Field for over 60 Years

A Performance Record That Guarantees

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- MANGANESE BRONZE
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UNIFORMITY

QUALITY

Foundrymen look for the Kramer trade-mark on brass and bronze ingots . . they know the value of Kramer's years of research and achievement

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CHICAGO 8

THE NEW B-35

Weight	10¾ lbs.
Height	7½ inches
Spindle	⅜" - 11"
6000 - 5500 - 4500 - 3500 RPM	

THE NEW B-12

Weight	10 lbs.
Height	7 inches
Spindle	⅜" - 11"
6000 - 5500 - 4500 - 3500 RPM	

For cup wheels, sanding pads, cut-off wheels, wire brushing.

Never Before!!

...SO MUCH POWER PER POUND

MEET the new Rotor Vertical Air Grinders! Never before have you had so much power in vertical air grinders...for such light weight! They're well balanced . . . easy on the operator. Here are *new* features to speed up your metal removal.

AIR O'TOOL

WRITE TODAY FOR BULLETIN No. 40.

AIR

THE ROTOR TOOL

HIGH CYCLE

products and processes

For additional information, use postcard at bottom of this page

501 Motor-driven trolley

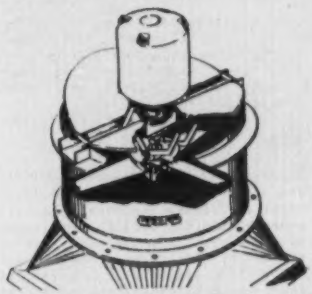
Motor driven trolley is designed to increase load and operator safety, lower hoist maintenance costs, and eliminate trolley brakes and complex electrical speed changing equipment. Hydraulic coupling is first application of fluid transmissions to hoisting equipment. Since motor starts free of any load and is loaded gradually by fluid coupling, acceleration is smooth and gradual, greatly reducing pendulum action of load and permitting ladles of molten metal to be carried without spilling. Fluid coupling is available for all Yale power-driven trolleys from 1/8 to 12 tons. *Yale & Towne Mfg. Co.*

502 Drill and carbide grinder

New Sterling drill and carbide grinder features such improvements as a simplified adjustment to compensate for wheel wear, permanently mounted diamond wheel dresser on drill grinding wheel guard, light fixture on flexible tube, and graduated quadrant for setting carbide tool grinding clearance angles accurately. *McDonough Mfg. Co.*

503 Roof ventilator

Volumes of air in the range of 5000 to 45,000 cfm are moved by the Posit-Aire, a powered roof ventilator. The instant the fan starts, mechanically actuated louvers open fully and automatically. When the fan stops, louvers close and lock. This arrangement blocks rain, snow, and drafts. It reduces fire hazard by eliminating roof draft. Because louvers look closed, burglar and sabotage protection is offered. Standard sizes range from 24 to 48 in. Special sizes, top or bottom motor mountings, or belt-driven units for corrosive atmospheres can be furnished. *Triper Products, Inc.*



504 Anti-rust paint

Rust-Cure, an anti-rust paint, can be applied to rusted surfaces without wire-brushing, scraping or sandblasting, thus eliminating time and labor required to paint corroded metal by ordinary methods. Rust-Cure seals rusted surfaces and retards further rusting action. Available in black, aluminum and clear, it can be applied by brush, dip or spray methods, indoors or out. *Monroe Co., Inc.*

505 Diamond saw blade

Clipper concrete-cutting diamond saw blades are adaptable to cutting of hard vitreous materials, as well as concrete, etc. Concrete containing limestone aggregate can be sliced up to 10 fpm when cutting at a depth of 1 in. Specifications are available for all types of aggregate and age of concrete. Blades are manufactured in 8 to 18 in. diameters and in thicknesses of 5/32 to 7/64 in, for use on any concrete saw. *Clipper Mfg. Co.*

506 Taxes! Taxes!

Quick method of computing payroll taxes is provided in a new payroll posting board form. The trouble is that FICA taxable wage base is $3600, unemployment compensation wage base is $3000, and the balance is not subject to either tax. Incorporating a solution into a payroll posting board makes it possible to reach a break-down with very little extra work. Here's the details: On the reverse side of the payroll summary sheet are printed three ruled columns. These are for "Taxable Payroll under $3000"; "Taxable Payroll from $3000 to $3600"; and "Non-taxable Payroll". After the week's payroll has been posted, the sheet is folded over so the columns align with the "Earnings to Date" entries. Then the week's wages of each employee are checked against the "Earnings to Date" entry and the proper tax figure inserted in the columns. Now the employer has a record of all wages paid, broken down by tax rate classification. Total of column one is the amount subject to unemployment compensation tax. Total of columns one and two gives the figure subject to FICA. Column three

continued on page 142

Exhibits Preview

52 | 5

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Chicago 5, Illinois

free/foundry information

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510 Floor surfacer

Flooring repair and resurfacing material which comes mixed for immediate use is detailed in 2-page bulletin, L-4581. Material is reported to be 4 times as strong as concrete, and resistant to oil, grease, acids, and moisture. *Paramount Industrial Products Co.*

511 Fabricating steel

An illustrated folder of 6 pages gives detailed instructions on welding, brazing, and cutting steel with torch and arc. Contained are instructions for use, techniques of application, and properties of 13 alloys—12 for welding and brazing, 1 for cutting. *All-State Welding Alloys Co., Inc.*

512 Test equipment

Complete line of testing and measuring equipment for laboratory and production use is summarized in 80-page catalog. Containing over 150 photographs and diagrams, GEC-1016 is intended primarily as a reference; each device is accompanied by list of other bulletins describing it in more detail. *General Electric Co.*

513 Acid-resistant cloth

A fabric that is resistant to chemicals, will not support combustion, and resists snagging is presented in 4-page Bulletin CF-28. Principal use is in work clothes. *Mine Safety Appliances Co.*

514 Protecting business records

Eight-page folder points out pitfalls of inadequate business record protection, using as examples companies whose records have been destroyed by fire. Of these, the booklet states, 43 per cent have been forced to go out of business. Also emphasized is the shaky position in which firms find themselves when they try to collect fire insurance and accounts receivable or to resist unjust claims. Folder concludes equipment and methods available to insure adequate protection against loss of records. *Remington Rand.*

515 Speed-reducing equipment

Pocket size catalog of Abart speed reducers and right angle gear motors gives 96 pages of engineering data on selecting the proper speed reducer for all applications. Included are charts of horsepower ratings, and ratios and installation graphs. *Abart Gear & Machine Co.*

516 Materials handling

4-page illustrated folder contains photographs and description of the Corrigan line of materials handling equipment for foundries. Shown are belt conveyors, rotary breakers, sand elevators, bucket elevators, car unloaders and chip conveyors. *J. C. Corrigan Co.*

517 Test machines

Eight-page folder illustrates various machines for tests in tension, compression, torsion, shear, fatigue, bending, and ductility. Separate bulletins are available for wear testing and testing of miniature samples. *A. I. Bushler.*

518 Mixer modernization

Six-page Bulletin 503 presents information on care, maintenance, and modernization of Simpson mixers. Offered are plows, anti-friction vertical shafts, single arm plow beams, gear enclosures, mulling wheels, material samplers, funnels for properly introducing liquids, air-operated doors, double discharge doors and aerator anti-wear changeover and safety grates. All items are illustrated and described. Included in bulletin are such auxiliary equipment as bucket loaders, screens, aerators, exhaust systems, liquid meters, timers, water injectors, and cooling hoods. *National Engineering Co.*

519 Ladle linings

Printed in two colors, 8-page Bulletin 102 traces the development of linings for desulphurizing ladles, and gives advantages of monolithic refractory linings in resisting soda ash slags. Illustrated sequence of construction shows the building of a wooden form to be used in ramming up monolithic linings. Both solid and collapsible forms are described. Another form made of welded and bolted steel plate is pictured and its construction briefly outlined. A full page of pictures shows how to line ladles and ladle covers. Two pages of text amplify this demonstration. In addition, many additional uses for monolithic refractory linings are listed for both ferrous and non-ferrous foundries. *Ironton Fire Brick Co.*

continued on page 143

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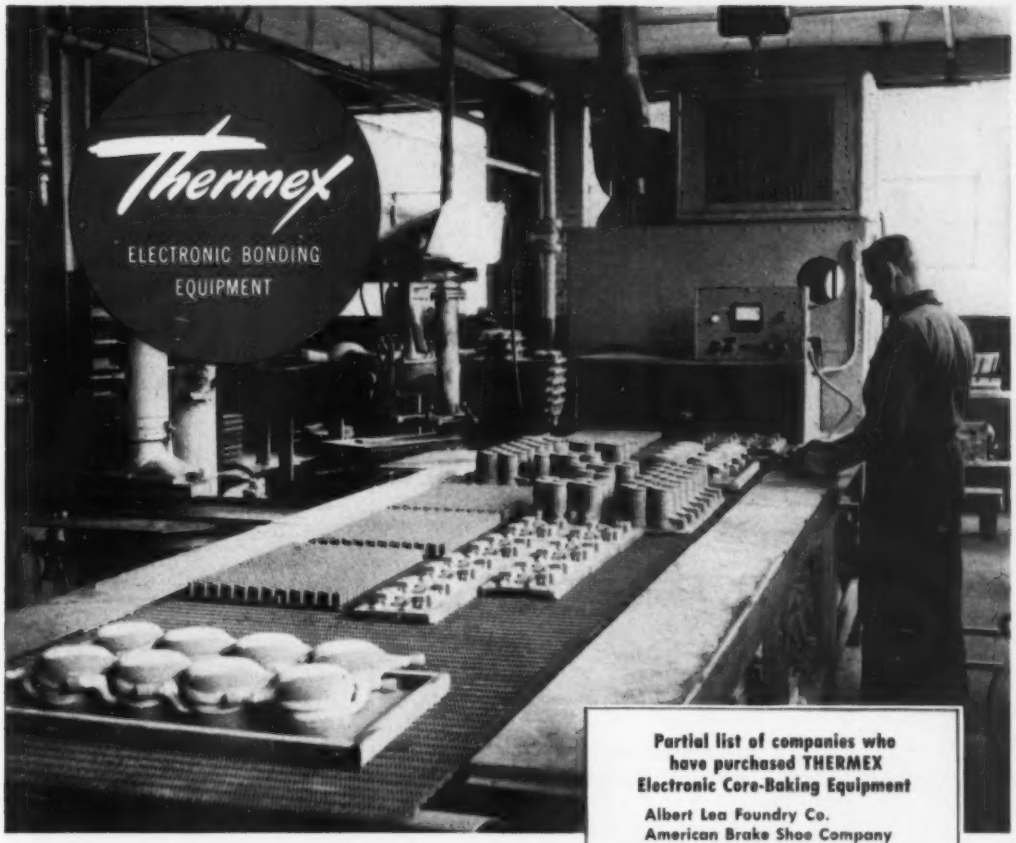

Partial list of companies who have purchased THERMEX Electronic Core-Baking Equipment

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Brugger Mfg. Company
James B. Clow & Sons
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Grand Haven Brass Foundry
Grinnell Corporation
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Here's the proven way to cut core-baking costs!

SPECTACULAR SAVINGS reported by users of THERMEX® Core-baking Equipment result from these advantages:

- ★ core-baking time cut from hours to minutes—reducing scheduling, handling, and labor cost drastically.
- ★ greatly improved quality of cores—reducing number of rejects.
- ★ efficient conveyorized handling of production reduces floor space requirements.
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A Thermex field engineer will be glad to show you proof of savings based on verified cost studies of installations. Take advantage of this cost-cutting, labor-saving equipment now. Write The Girdler Corp., Thermex Division, Louisville 1, Kentucky.

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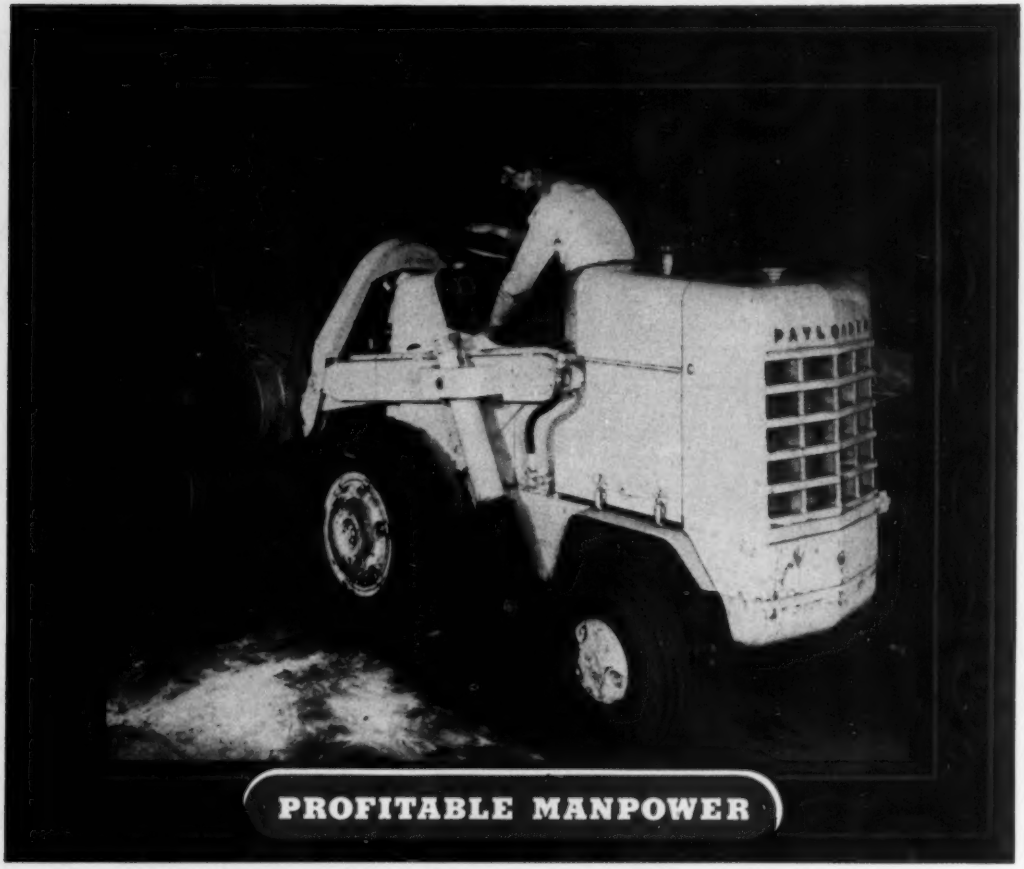

This man may have been good with a wheelbarrow and hand shovel, but his production is several times greater as a "PAYLOADER" pilot. He's happier and so is his boss because they both make more money.

When it's a matter of handling bulk materials — sand, scrap, coke, chips, limestone or *any* bulk material — chances are you can move it faster, cheaper and better with a "PAYLOADER" because these special tractor-shovels are proven cost-cutters in hundreds of foundries.

"PAYLOADERS" are available in seven sizes, from 12 cu. ft. to 1½ cu. yd., to master your jobs both indoors and outdoors. Get full facts *now* on cost-cutting, time-saving, production-boosting "PAYLOADER." The Frank G. Hough Co., 711 Sunnyside Ave., Libertyville, Ill.

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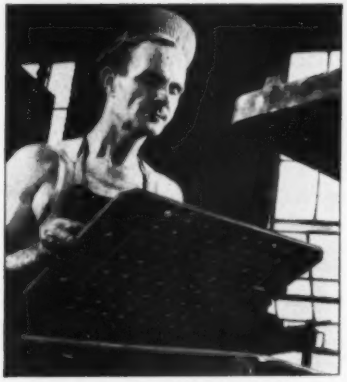
"EDCO BOTTOM BOARDS eliminate swelled castings"



Above photo shows Mid-City Foundry Company molder placing EDCO DOWMETAL Bottom Board on flask preparatory to pressing. Mid-City Foundry produces high quality gray iron and alloy castings.

Take a tip from E. F. Dublinski. He speaks from experience in saying —"EDCO DOWMETAL Bottom Boards eliminate swelled castings". Since switching to magnesium boards, Mid-City Foundry does not have castings ruined through swelling caused by depressions burned into out-dated wood boards.

EDCO DOWMETAL Bottom Boards help produce castings that are true to pattern. The exclusive grooved and vented design permits escape of gasses, and insures mold stability. Causes for rejects are kept to a minimum.

"We consider EDCO DOWMETAL Bottom Boards as permanent equipment at Mid-City," adds E. F. Dublinski, "because they'll outlast wooden boards at least 30 to 1 and in no time at all pay for themselves."

Your molders will like handling these boards because they are light in weight, easy to stack, and there's no danger of splinters. EDCO DOWMETAL Bottom Boards will not warp or rot—there are no nails to come out, nothing to break or split—no upkeep.

Write us, or phone CApitol 7-2060 for price schedule and list of 74 standard sizes available from stock.

CHRISTIANSEN CORPORATION
1521 N. KILPATRICK AVENUE • CHICAGO 51, ILLINOIS
Aluminum Alloy Ingots • Zinc Base Casting Alloys

Illustration shows cope and drag set on fender pattern for STAR PATTERN & MFG. CO., Benton Harbor, Mich.

for Higher Casting Production...

look to **ACCURATE** cope and drag sets

Because they have been a profit maker for several hundred of the leading foundries all over America...

For example, when you use Accurate cope and drag sets you get clean smooth partings. Patterns as cast are straightened and have correct alignment marks. This helps to decrease your finishing costs.

Maintenance costs are much lower because you get longer life..

Wherever used, Accurate cope and drag sets have been the means of producing greater volume of castings at lower costs.

Why not apply this idea to your foundry? It has been profitable to others and will be to you, too.

Write for catalog No. 115. It tells the whole story.

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By Air Freight, Parcel Post, Special Delivery or Railway Express. Pick-up & delivery by jobber representatives in the following areas:

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Workman building open mold for the gear rim which weighs nearly one ton.

Huge gear rim of a barking drum for a pulp mill has diameter of 14½ feet.

STEVENS FACINGS Favored by Finns

Halfway around the world—in Tammerfors, Finland, to be exact—Stevens Foundry Facings are as popular with foundrymen as they are right here at home. The *Tammerfors Linne-och Fern-Manufaktur Aktie-Bolag*, a Finnish manufacturer of pulp and paper machinery and other heavy industrial equipment, reports that their use of Stevens No. 114 Core Coating has given them "very satisfactory" casting results. As proof, they forward these pictures, showing a typical product of their gray iron foundry.

Of course, there's no need to travel to Finland, or anywhere else, to find a foundry that is a confirmed booster of Stevens Facings. The chances are there's one right in your neighborhood. You see, Stevens has been furnishing foundrymen with the BEST in facings and supplies for nearly three-quarters of a century. And that vast experience is behind every Stevens product you order. Have your Stevens representative tell you about ALL the Stevens foundry items. There's no obligation. Call him today or write direct to *Frederic B. Stevens, Inc., Detroit 16, Michigan.*

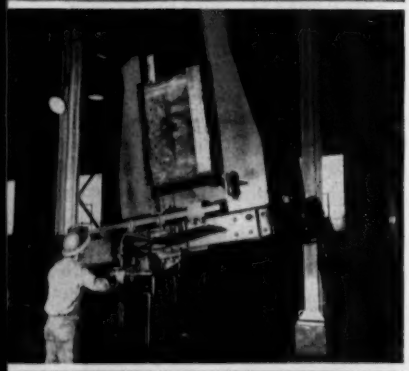
Modern building which houses the foundry of Finnish manufacturer.

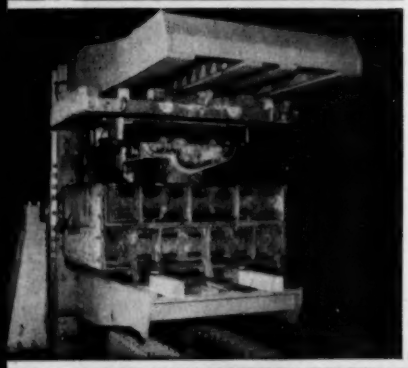
Teeth of gear rim were molded in cement sand coated with Stevens No. 114 Core Coating.

"EVERYTHING FOR A FOUNDRY"
TRADEMARK

FREDERIC B. STEVENS INCORPORATED

DETROIT 16, MICHIGAN





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Internationals are designed and built by experienced Foundry Engineers, who have a practical knowledge of the problems of the foundry business.

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The Big Features and Advantages of
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- **Ideal for Short runs**
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- **Manufactured in sizes to cover your foundry needs**
- **Turnover Capacity—1500 lbs. to 14,000 lbs.**

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Perfect Companions to the Type AN Machine. Rollers are an integral part of the machine for roll-off or roll-on — Jolt capacities 1500 to 12,000 lbs.

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SPEED UP GATE REMOVAL with DoALL FRICTION SAWING!

THE speed of DoALL Zephyr Band Machines for removing gates, risers, flash and other superfluous material from castings will surprise you. DoALL Zephyr Band Machines are fast: they have actually saved as much as 90% in time and tool costs, depending on the thickness of the work. With DoALL you are able to get into complicated spaces and cut *close* to the casting and as finish is generally of high quality, grinding can be either eliminated or materially reduced. The cut is made fast enough so as not to allow heat penetration into the side wall of the finished cut and skin hardness never exceeds .003" deep. Zephyr Friction Sawing means low tool cost and greater tool safety for the operator.

Where extremely fine tolerance and optimum efficiency is desired, automatic hydraulic feeding tables are available. There is a size DoALL Zephyr for every pocketbook and for almost every problem. If you have a special problem we will cooperate with you in tailoring saw design to solve it. Here are advantages you should look into. Ask for a free demonstration in your own plant. Call our local DoALL Sales Service Store or write.

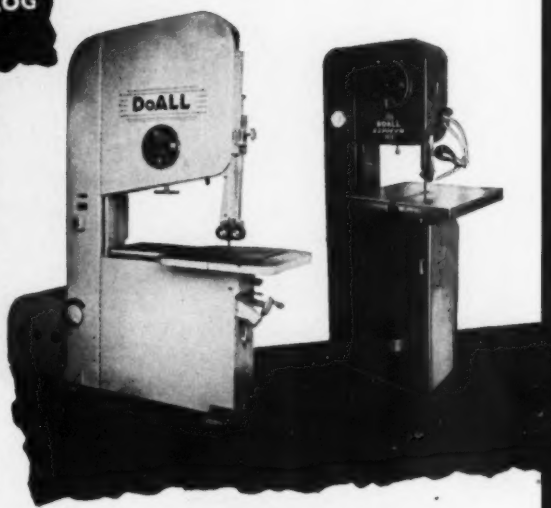
THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

Above: **Here is a DoALL Zephyr in a typical installation removing dead metal.**

Below: **With DoALL Friction Sawing you can cut close to the live metal and reach the hard-to-get-at places.**

SEND FOR CATALOG

There is quite a story on costs and speeds in handling castings of various thicknesses. Ask for complete details with a catalog on DoALL Modern Band Machines.



BMF-1

DoALL

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PENOLYN CORE OIL

For Maximum Foundry Efficiency . . . be sure to specify Penolyn Core Oil. There is a grade of Penolyn for every type of casting, to meet the most exacting requirements of every conceivable Foundry and Core Room Practice.

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• Black Hills Bentonite may be exactly what you want. It is strong, uniform and dependable. For some applications, it is the ideal clay because it surpasses all others in toughness. It excels all other clays in dry strength. If you require maximum permeability combined with maximum hot strength, choose Black Hills Bentonite.

But maybe you do not want toughness. Maybe your sand problems are *different*. Then remember that Black Hills Bentonite is only one of four bonding clays in the E. C. P. line. Each has distinct properties. If one of these clays does not answer your need, there are numerous combinations available which will. Our 26-year experience is at your command — now, without obligation.

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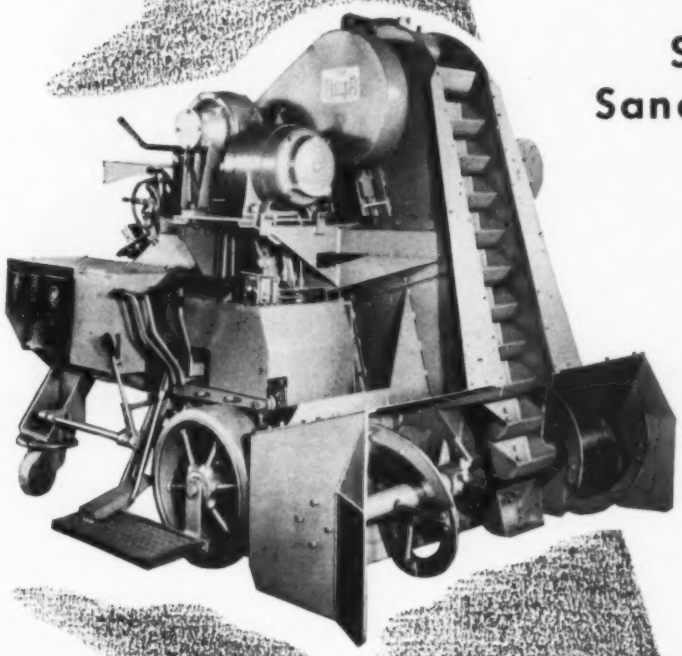
completely mechanized *sand preparation*

with the new ROYER Self Loading Self Propelled Sand Conditioner



This new hydraulically powered Royer Model RPL-R Sand Conditioner gives you completely mechanized sand preparation. Moving into the sand heap under its own power, it scoops up, completely conditions and discharges from 40 to 60 tons of fluffy, trash free molding sand per hour. In one complete operation the sand is thoroughly mixed, blended and aerated . . . **magnetic separation** removes all tramp iron and small scrap.

Time-consuming, back-breaking labor is entirely eliminated with a consequent saving in labor costs . . . and the properly prepared sand helps to make true-to-pattern molds, greatly reducing rejects and cleaning and grinding time.

You will profit with a Royer —write for further information on this self loading, self propelled model.

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FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

155 PRINGLE ST., KINGSTON, PA.

We're

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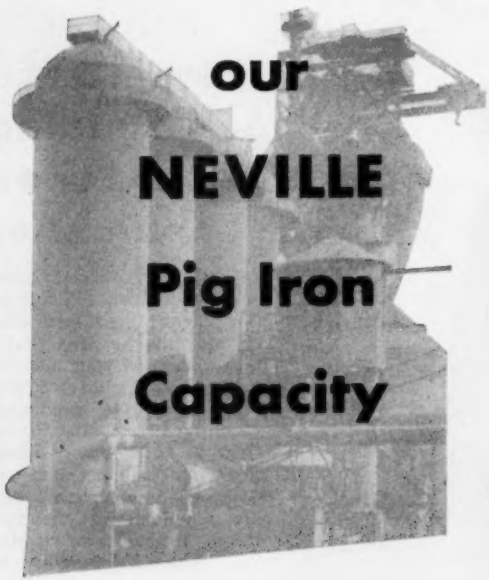
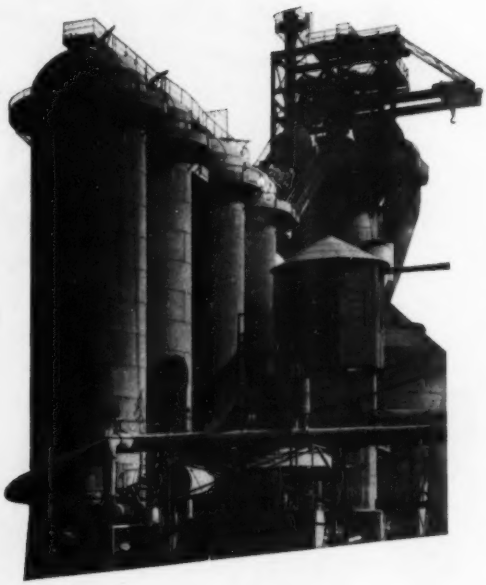
our NEVILLE Pig Iron Capacity





WORK is now progressing steadily on the erection of a new blast furnace at our Neville Island plant. When this furnace begins operation—scheduled for sometime in September—our capacity to produce Neville Pig Iron will be doubled. Our entire production of Neville Pig Iron is going to the foundry trade. The additional output of this new furnace will make it possible for us to serve our foundry friends better than ever.

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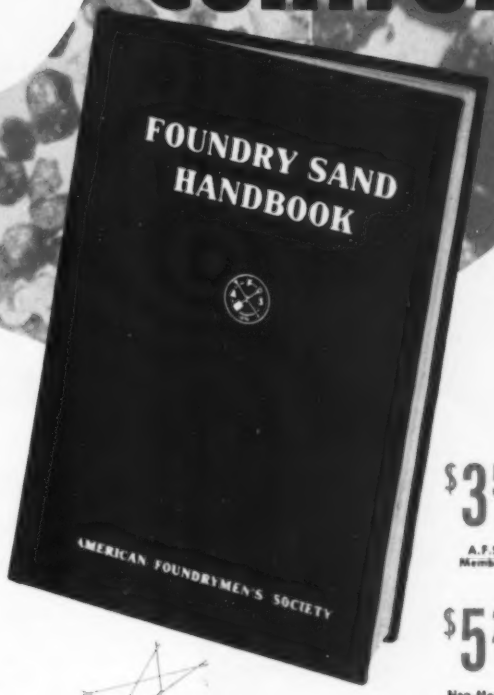

A casting is only as good as the mold!

A foundryman may select his metal with the greatest of care. His melting procedure may be in accordance with recommended practice. And he may exercise full control over his pouring temperatures and pouring methods. BUT... he cannot consistently produce quality castings in molds prepared from uncontrolled sand mixtures.

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Elevated Temperature Tests on Foundry Sand Mixtures
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Mechanical Properties of Core Sand Mixtures
Method for Determining Strength of Core Paste—Tentative Standard
Non-Standard Tests
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Comments on Maintenance of Testing Equipment
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265 pages . . . 23 separate sections . . . 93 illustrations . . . 13 tables . . . add to the completeness of this 6th edition of the cloth-bound A.F.S. FOUNDRY-SAND HANDBOOK.

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REDUCED

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Pre-measured
SCORED BRICK
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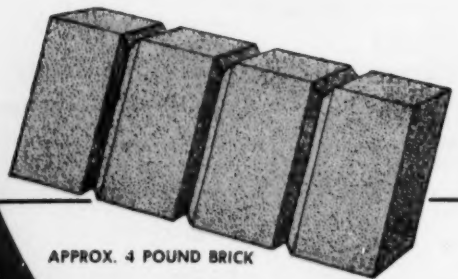

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- **REDUCES SULPHUR**
- **KEEPS SLAG FLUID**

In hundreds of foundries where Famous Cornell Cupola Flux is used to cleanse molten iron, you will see cleaner, sounder castings—and an amazingly small scrap pile.

Machining operations are faster and smoother.

Deliveries are not handicapped by casting make-overs.

SCORED BRICK FORM, exclusive with Famous Cornell Cupola Flux, not only makes the labor in fluxing molten iron practically nil, but promotes greater accuracy in using and prevents waste.

It takes but a few seconds to lift Famous Cornell Cupola Flux from container and toss it into the cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges, as per instructions.

WRITE FOR BULLETIN NO. 46-B

Pay-off!

IRON, BETTER CASTINGS.
CUPOLA MAINTENANCE.

THE CUPOLA before using Famous Cornell Cupola Flux.

THE CUPOLA where Famous Cornell Cupola Flux is used.

CUPOLA FLUX

- **KEEPS CUPOLAS CLEANER**
- **INCREASES EFFICIENCY**
- **REDUCES DOWN TIME**

Where Famous Cornell Cupola Flux is used to condition molten iron for better castings, foundry owners get an extra dividend on their investment through more efficient and economical cupola operation.

Bridging over is practically eliminated and the drops are cleaner.

And there is less erosion of brick or stone due to a glazed or vitrified surface which Famous Cornell Cupola Flux forms on cupola lining. Less erosion means less patching and longer period between lining replacements.

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

USCO D-3

USCO D-3 is a 4% Cu—3% Si sand casting Aluminum Alloy . . . produced from raw materials to finished ingot under our famous Precision Production Control System.

USCO D-3 has excellent foundry characteristics . . . insuring you of ease of melting and pouring . . . giving you gas and dross free castings. With USCO D-3 you can produce dependable, heat-treatable castings with good machinability. Fewer rejects mean money in your pocket.

The USCO stamp on your aluminum alloy ingot is a guarantee of time-tested quality. Why not join our ever growing list of satisfied customers today?

FREE—Send for your USCO Aluminum Alloy Selector. A handy guide to analysis, specifications and many other foundry problems.

For 48 years, pioneers in aluminum development.

USCO **U. S. REDUCTION CO.**
East Chicago, Indiana

PLANTS: EAST CHICAGO, INDIANA • TOLEDO, OHIO

Melting Capacity
30,000 pounds per hour

-and five men
do it all

AJAX INDUCTION FURNACES

In operation at the Waterbury, Conn., plant of the Scovill Manufacturing Company.

As a part of the most modern and completely integrated brass cold rolling operation in the world, Scovill Manufacturing Company of Waterbury, Connecticut, has in operation three 1000 kw. Ajax-Scomet electric induction melting furnaces with a production of 10,000 pounds each per hour. These furnaces, the largest in the brass industry, are equipped with the most precise control of melting temperatures by means of a permanently inserted thermocouple and have thereby considerably reduced melting losses.

Every half hour each of these furnaces in turn discharges its 5,000-pound charge into a ladle which is transferred by crane to a holding furnace (shown at right) of 9,000 pounds' capacity. This furnace is mounted over the continuous casting machine located on the floors below, and thus is able to provide a permanent flow of molten brass to the mold. The intermixing of the charges from the three furnaces gives additional uniformity of composition.

WRITE FOR FURTHER DETAILS ABOUT AJAX FURNACES

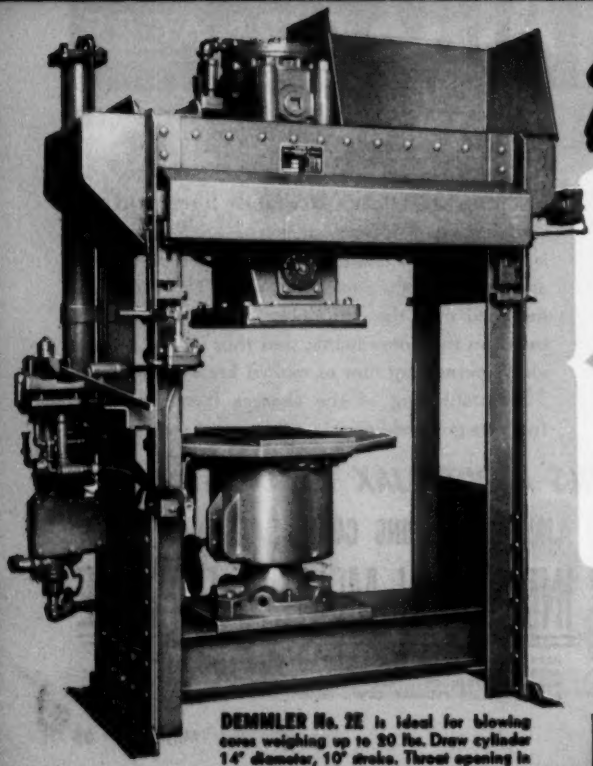
AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX TAMA-WYATT

INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

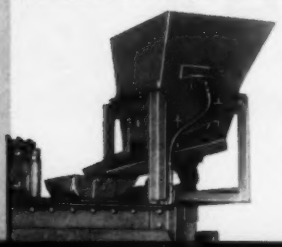
32 DEMMLER CORE BLOWERS



DEMMLER No. 2E is ideal for blowing cores weighing up to 20 lbs. Draw cylinder 14" diameter, 10" stroke. Throat opening in carriage 7" diameter.

Better 8 Ways

1. Ultra high speed blow valve action — increasing initial blow pressure 20% above other machines.
2. Magazine exhaust valve — extra large size — quick acting — immediately exhausts air from magazine after core is blown.
3. Carriage rails — on outside of machine frame — out of sand area — where drawing accuracy would be impaired.
4. Leveling adjustment — 4 screw adjustment for complete adjustment of core box to draw — EASILY ACCESSIBLE.
5. Completely enclosed drawing post — drawing accuracy within thousandths — protected from sand and abrasion — assuring long, trouble-free life.
6. 2 speed hydraulic draw control — low speed while vibrator is acting and quick drop after core is drawn.
7. Hard, chrome plated valve seats—insure against rust and deterioration.
8. All parts of machine easily accessible for low maintenance costs.



DEMMLER Vibratory Sand Feeders increase core blower production as much as 25%! Sand stored in large hopper flows like water while vibrators are operating. Powered by rotary type pneumatic vibrators. Ends poking sand nuisance!

help speed *Studebaker* production

The efficient manner in which Studebaker doubled capacity of their foundry is a well known story to the trade today.

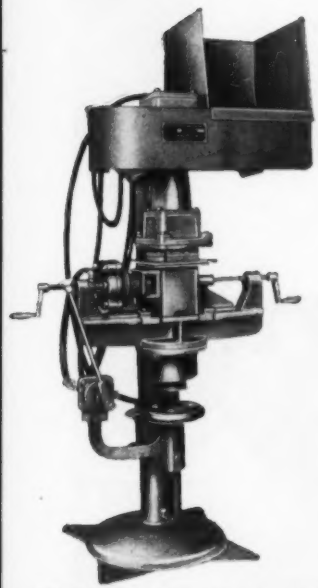
It pays tribute to the alert minds and capable hands for which the South Bend plant has long been known.

We at DEMMLER are gratified that these progressive Studebaker people have come to depend to a large extent on DEMMLER core blowers for their enviable record of fast, economical production of quality cores.

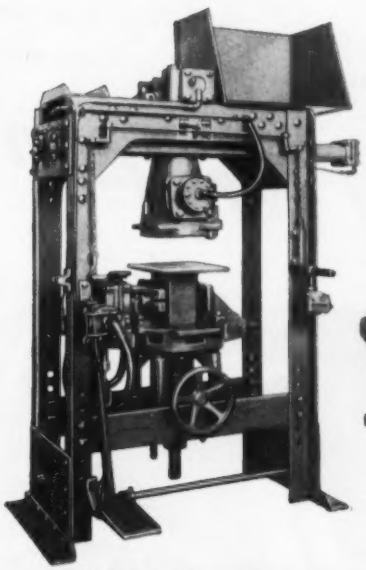
Thirty two DEMMLER core blowers are now in service at Studebaker!

Foundries everywhere have found that DEMMLER core blowers, because of their many outstanding features, are the wisest core blower investment on the market today!

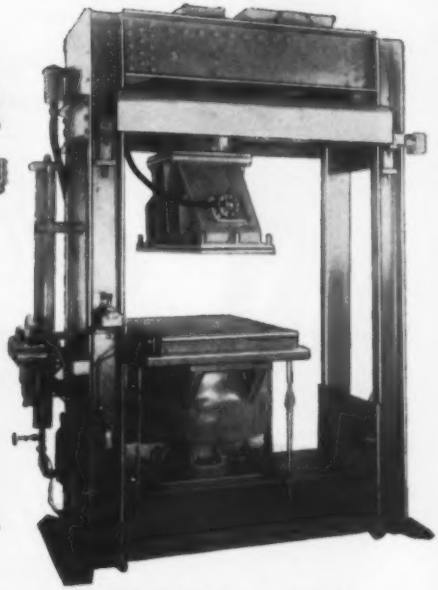
That's because DEMMLER core blowers—and only DEMMLER Core Blowers — offer you all eight of the important design features by which core blower value is determined.



DEMMLER No. 55 provides answer to fast, economical production on short run jobs! One hand valve operates both vertical and horizontal core box clamps. Capacity, cores weighing up to 5 lbs.



DEMMLER No. 1 is general purpose machine. Vertical clamping diaphragm, 10½" diameter. Capacity, 8 to 10 pound cores. One of the most popular core blowers ever built.



DEMMLER No. 4E handles cores weighing from 35 to 250 lbs. and up in weight. Draw cylinder 20", 22" or 26" diameter, 10" stroke. Throat opening in carriage 13" diameter.

Wm. DEMMLER & BROS., Kewanee, Illinois

MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911

If you're planning
MORE TONNAGE . . .
The erection of a new foundry, an addition or extension to your present production facilities . . .
for expert and complete service on all phases of Engineering, Construction, Equipment . . .
Call Ferguson!
THE
H·K·FERGUSON
COMPANY
ENGINEERS AND BUILDERS

EXECUTIVE OFFICES: Ferguson Bldg., Cleveland • NEW YORK OFFICE: 19 Rector St. • HOUSTON OFFICE: 2620 S. Main St. • CHICAGO OFFICE: 1 N. LaSalle Bldg. • LOS ANGELES OFFICE: 810 Title Guarantee Bldg. • CINCINNATI OFFICE: 31 E. 12th St. • SAN FRANCISCO OFFICE: 74 New Montgomery St.

Foundrymen in the news

T. W. Curry

Thomas W. Curry, former metallurgist for the Lynchburg Foundry Co., Lynchburg, Va., has been appointed to the newly created post of director of manufacturing research and methods. Mr. Curry was the A.F.S. Simpson medalist in 1951, has presented many A.F.S. convention papers, and written numerous technical articles.

Eugene P. Morton has joined Allis-Chalmers Mfg. Co., Milwaukee, Wis., as an assistant engineer.

R. A. Bowman has been appointed to succeed **Martin L. Killigallon** as plant manager, Berry Div., Oliver Iron and Steel Corp., Pittsburgh.

Andrew M. Ondreyco, national director of A.F.S., is now associated with General Metals Corp. at the company's Metals Div. in Oakland, Calif. Previous affiliations include Westinghouse Air Brake, Meehanite Metal Corp., and Cooper-Bessemer Corp.

Thomas R. Walker Jr. has resigned as director and vice-president in charge of pipe production of Warren Foundry & Pipe Corp., New York.

Edward Tallalian has been appointed utility foreman of the maintenance division, Oliver Iron & Steel Corporation, Pittsburgh.

Charles W. Wright becomes plant superintendent, and **Charles J. Bryk** becomes brass foundry foreman of Eddy Valve Co., Waterford, N. Y. **Earl W. Gradoni** moves to iron foundry foreman.

William A. Casler, assistant director of research, has been named manager of program development at Armour Research Foundation of Illinois Institute of Technology, Chicago. In his new position, he will assist in planning and developing new research programs.

Albert L. Hunt, formerly works manager of National Bearing Div., American Brake Shoe Co., St. Louis, was recently appointed general superintendent of foundries for National Bearing. He is a national director of A.F.S. **Vernon G. Nieberlein** was appointed St. Louis district engineer.

James Suttie, vice-president, American Steel Foundries, Chicago, has been honored with presentation of the Lorenz

James Suttie

Memorial Gold Medal, the top award of Steel Founders' Society of America. Award of the Society's Technical & Operating Gold Medal was made to **Luther A. Kleber,** vice-president in charge of manufacturing, General Steel Castings Corp., Granite City, Ill. **Harold H. Johnson,** chief metallurgist, National Malleable and Steel Castings Co., Sharon, Pa., received the Steel Foundry Facts Award for excellence of material published in the Society's technical publication. **H. A. Forsberg,** vice-president of Continental Foundry & Machine Co., East Chicago, Ind., was elected president of the Society; **Carl F. Barchfeld,** sales manager of the Commercial Steel Casting Co., Marion, Ohio, became Society vice-president; and **Arthur S. Breithaupt,** vice-president and sales manager of Dodge Steel Co., Philadelphia, was named a director and executive committee member. Awards and elections transpired at the Society's annual meeting March 18 in Chicago.

John K. Beidler was elected a director of Dravo Corp., Pittsburgh, at its annual meeting April 15. He has been associated with the company since 1935.

John E. Rehder, foundry engineer for the Dept. of Mines & Technical Surveys, Ottawa, Ont., Canada, is the author of "*Nodules and Nuclei in Nodular Cast Iron—Part II*" starting on page 87 of this issue. First part of this study appeared in February. Mr. Rehder is a graduate of McGill University and a frequent contributor to AMERICAN FOUNDRYMAN. He has done extensive research in nodular iron and other foundry fields. Previous affiliations include Walker Metal Products, Windsor, Ont.; Bowmanville Foundry Co., Bowmanville, Ont.; and Grinell Co. of Canada, Ontario, Ont.

L. A. Kleber

Alfred H. Hesse has become vice-president and general manager of Stemac, Inc., Chicago. He was associated with R. Lavin & Sons, Inc., as metallurgist and advertising manager for the last six years. Prior affiliations include Battelle Memorial Institute, Naval Research Laboratory, and Western Brass Mills.

Mathew J. Ludwig has been appointed vice-president-controller and **Theodore Thomas** appointed assistant controller by Basic Refractories Inc., Cleveland. Ludwig first joined Basic in 1930 as office boy. His previous post was that of secretary. Thomas has been with the company since 1946 as a statistician. Replacing Ludwig as secretary is **William A. Melville,** formerly assistant secretary of the company.

Hal Lennon is now managing the Pittsburgh Div. of R. Lavin & Sons, Inc. He was transferred from the Chicago sales and purchasing department for the job.

W. J. Sperling becomes first holder of the newly created position of vice-president and manager of Milwaukee operations for Chain Belt Co. of Mil-

waukee. He will have executive responsibility for the three major local divisions. **M. G. Jewett** takes over as manager of the Chain & Power Transmission Div. **B. F. Devine,** vice-president of the Construction Machinery Div., becomes a staff officer of the company. **A. K. Thomas** assumes the position of managing the Construction Machinery Div., while **W. A. Clayton** becomes its sales manager and **J. W. Lendved** becomes its director of engineering. **W. C. Messinger,** will be assistant secretary.

Donald Alverson, core room supervisor for Eaton Mfg. Co., Vassar, Mich., is the

Donald Alverson

author of *"Effects of Annealing on the Removal of Burned-on Sand"* starting on page 91. A graduate of Michigan State College, Mr. Alverson became interested in foundry operations through the Foundry Educational Foundation and entered the employ of Eaton's Foundry Div. upon graduation.

George W. Cannon, retired board chairman of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., has been honored by the University of Aachen (Western Germany) for his extraordinary contributions in advancing the science of the foundry industry with the awarding of the title Honorable Doctor of Engineering. The news was radioed to AMERICAN FOUNDRYMAN by Prof. E. Piwowarsky.

Robert J. Painter has been named treasurer of ASTM, Philadelphia, replacing **John K. Rittenhouse,** retiring after 43 years. **Dorothy P. Douty** will be Painter's assistant. Painter will continue to be assistant secretary, associate editor of the *ASTM Bulletin,* and technical contact man for the Society.

Norman A. Matthews has been appointed assistant chief metallurgist of the Metallurgical Research Dept., American Brake Shoe Co., Mahwah, N. J. He was formerly division metallurgist for the Electro-Alloys Div. at Elyria, Ohio.

Wendell P. McKown Jr. is the new works manager for Cooper Alloy Foundry Co., Hillside, N. J. For the past 10 years he has been purchasing agent for Pratt & Whitney Aircraft Div., United Aircraft Corp.

Charles E. Walker, manager of engineering and production at Vulcan Mold & Iron Co., Latrobe, Pa., was appointed March 18 to the new position of vice-president of engineering and operations. Walker has been with Vulcan for almost 10 years.

E. E. Ensign, until recently research metallurgist at the Ford Motor Co., has joined the staff of the A. R. D. Corp., New York, as vice-president.

Edwin W. Doe

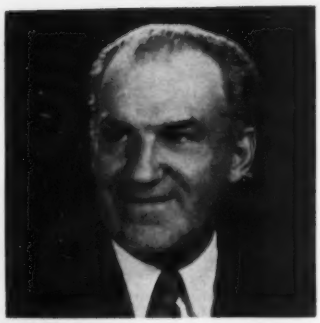
Edwin W. Doe, formerly of Franklin Technical High School, New York, is currently in Rio de Janeiro, Brazil, instituting a vocational training program in local schools for the Education Div. of Institute of Inter-American Affairs. Mr. Doe is the author of the recently published A.F.S. foundry text book FOUNDRY WORK. Mr. Doe is offering assistance to Brazilian schools in developing foundry training and in-plant training for foundry workers.

Robert C. Becherer was elected president of Link-Belt Co., Chicago, succeeding **George P. Torrence.** Becherer and **William J. Kelly** were both added to the company's board of directors.

Kenneth G. Hubach has been appointed sales manager of the Foundry & Commercial Weldment Dept. of Baldwin-Lima-Hamilton Corp., Philadelphia. His duties will involve the development of long-range possibilities in the field of castings and weldments.

Jeffrey W. Meyer is back with Wilson & Geo. Meyer & Co., San Francisco, having been discharged from the army.

Robert J. Anderson will head the newly established Metallurgy Dept. at Southwest Research Institute, San Antonio, Texas. His department will undertake industrial metallurgical research in foundry practice, process and physical metallurgy, and metal economics. Dr. Anderson was awarded the McFadden medal by A.F.S. in 1925.



C. C. Spencer

Charles C. Spencer, melting superintendent, Electric Steel Castings Co., Indianapolis, wrote *"Making a Separate Oven for Drying Sand-Lined Ladles"* which appears on page 82 of this issue. Mr. Spencer worked for Electric Storage Battery Co., Baldwin Locomotive Works, Midvale Steel Co., and E. G. Budd Co., all of Philadelphia, before joining Electric Steel Castings Co.

Arthur C. Buesing, after serving for 10 years as metallurgist and manager of the Greensburg plant of Williamson Heater Co., is now working as a sales engineer for Modern Equipment Co., Port Washington, Wis. Other previous affiliations include General Motors Co. and Maddox Foundry Machine Works, Archer, Fla.

Harry A. Porter, with National Malleable & Steel Castings Co., Chicago, has taken the place of **John Staiger** as district sales manager for Michiana Products Corp. His office is at 80 E. Jackson, Chicago. Mr. Staiger is in the hardware business in Michigan City, Ind.

Paul J. Scherbner has been named superintendent of the Non-ferrous Foundry Dept., Winters Foundry & Machine Co., Inc., Canton, Ohio. He comes to Winters from the Sperry Gyroscope Corp. to direct the fabrication and control of aircraft quality aluminum and bronze castings.

G. G. Willson takes over as manager of the technical service station, coated abrasives laboratory, Minnesota Mining & Mfg. Co., St. Paul, Minn. He will be responsible for all technical service functions as well as for a technical training program for sales personnel.

Norman H. Terry, author of *"Pricing Castings by the Pound is a Dangerous Fallacy!"* which starts on page 78 of this issue, is vice-president of Canadian Sumner Iron Works Ltd., Vancouver, B. C., Canada. A past president of the Canadian Society of Cost Accountants, he was active in the formation of the British Columbia Chapter of A.F.S. and was the group's first chairman.

continued on page 137

VOLCLAY BENTONITE
NEWS LETTER No. 27

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

Does Your Casting Have

* S.A.?

Many castings are sold by eye sight alone. If the surface finish does not appeal to the buyer, the physical properties of the castings certainly will not appeal to him.

Many machine tool castings and other castings that appear before the public eye **on the selling floor, either attract the buyer or distract** his attention toward a competitive product.

Those companies producing die castings, permanent mold castings, investment castings, and others **sell castings on appearance** and almost cast to a machine finish.

The buyer must become aware of better casting finish, as it is our opinion that this is an important phase of satisfying customers today.

In order to obtain better casting finish, the base sand used must be as fine as possible to produce a good casting.

The bond must be selected so that a minimum amount can be used, thus allowing a minimum of temper water used.

This bond must allow flowability in order for the mixture to ram and jolt firmly around the pattern **with the minimum of casting defects resulting.**

Panther Creek (Southern bentonite) does this as no other bond, why not give it a trial? **We are interested in producing better castings for you!**

*—**SALES APPEAL**

AMERICAN COLLOID COMPANY

Chicago 54, Illinois • *Producers of Volclay and Panther Creek Bentonite*

CRUCIBLES

Developed into

THE WORLD'S MOST EFFICIENT NON-FERROUS MELTING UNIT

No one knows how long it took one of the ancients to melt a few pounds of bronze—probably all day.

Now with Crucibles, foundries are melting 240 lbs. of bronze in seventeen minutes or fourteen pounds per minute!

The illustration shows the cleanliness and efficiency obtainable with Crucible furnaces.

Comparable results are achieved with other fuels generally available for Crucible melting.

WRITE CRUCIBLE MANUFACTURERS ASSOCIATION FOR "CRUCIBLE-MELTERS' HANDBOOK"; MAILED FREE. OR ASK ANY CRUCIBLE MANUFACTURER ABOUT SIZES AND SHAPES AVAILABLE.

CRUCIBLE MANUFACTURERS ASSOCIATION

THESE FIRMS CAN SERVE SOME OF ALL YOUR REQUIREMENTS FOR CRUCIBLES

BOSS-TACONY CRUCIBLE CO.

AMERICAN REFRACTORIES & CRUCIBLE CORPORATION

LAVA CRUCIBLE-REFRACTORIES COMPANY

ELECTRO REFRACTORIES & ABRASIVES COMPANY

VESUVIUS CRUCIBLE COMPANY

JOSEPH DIXON CRUCIBLE CO.

trends

Foundry health—everybody's business . . .

■ Considerable evidence shows that foundrymen are making foundry health and safety their business. With the Safety & Hygiene & Air Pollution program well under way, foundries are making contributions and pledges to advance the 10-year program initiated by A.F.S. on behalf of the foundry industry.

Some foundries are further contributing to the SHAP program by making it possible for their men to sit on the committees preparing information and publications for the program, and by permitting them to release ideas and data developed in the individual plants. A price cannot be set on this type of contribution to the industry, but in dollars it is far beyond the reach of any single plant. It is possible to secure this information only through cooperative effort and enthusiasm for making the foundry a better place in which to work.

Management interest in foundry health was strongly evidenced during the recent conference on health protection in foundry practices at the University of Michigan, where attendance was almost twice the number set as the limit of effective discussion group size. Discussion was not hampered, however, and conference attendants eagerly questioned speakers at length and traded ideas with each other.

Another indication of the desire for information of the type that tells what to do and how to do it is found in the requests for copies of health conference proceedings. The requests have all come from presidents vice-presidents, managers, and other top management men. They are being told that selected papers will appear in "The Foundrymen's *Own* Magazine" and that the entire set will appear as an A.F.S. publication.

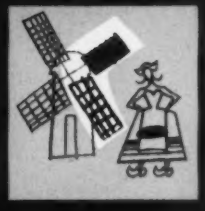
As an example of what management can and should do, W. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich., concluded the two-day conference with a description of his company's health and safety program. He showed that the program has saved life, limb, and suffering, and in addition has cut insurance rates to about one-eighth the rate of the average foundry.

The Auto Specialties program can well serve as an example for progressive foundries interested in making foundry health and safety a significant part of their business.

Foundry laundry modernizes . . .

■ Making the foundry a better place in which to work is Erie Malleable Iron Co., Erie, Pa., where automatic washing machines are being installed. They replace the non-automatic machines unable to keep up with the high demand for an unusual service performed by the company. Foundrymen who want their work clothes washed leave them out for the night man. He washes them, hangs them up to dry, and they're ready for the foundry workers when they come onto the job.

International Foundry Congress & Show



News Story

■ Crossroads of the foundry world in '52, the week-long A.F.S. International Foundry Congress drew top technicians and operating men from 30 nations to hear the latest in metal castings technology and to see the newest developments in tools for the foundry industry.

Held in Atlantic City's huge Auditorium, largest in the world, the Congress & Show was the most extensive in A.F.S. history, running the full week of May 1 through 7.

Built around the theme of "Technology plus Tools," the 1952 International Foundry Congress & Show co-featured a week-long technical program of more than 100 papers, symposia and reports covering every phase of metal casting, and the gigantic Foundry Show, in which more than 270 of the world's leading foundry equipment, supply, and service firms exhibited latest tools for the foundry trade on a single floor of Atlantic City's great Municipal Auditorium. Exhibit space occupied was 87,498 sq ft, 9598 more than the 1950 A.F.S. Congress.

Feature events

In addition to the technical program and show, the 1952 International offered numerous events of interest to the many thousands of foundrymen from the United States, Canada, Mexico and overseas attending the Congress.

These events began with a colorful Official Opening Ceremony on Thursday morning, May 1. On the following day, the Annual A.F.S. Chapter Officers and Directors Dinner gave officials of the 40 A.F.S. chapters in the United States, Canada, and Mexico an opportunity to compare notes on chapter activities and swap shop talk.

Annual Business Meeting of the Society, held Saturday morning, May 3, was attended by hundreds of foundrymen from North America and overseas, who heard A.F.S. President Walter L. Seelbach give the presidential address. Also on the program were the awarding of cash prizes to the five top winners in the 1952 A.F.S. Apprentice Contest, and election of Officers and Directors of the American Foundrymen's Society. Official representatives of many overseas technical associations participated in the program.

Hoyt Lecture draws 800

Immediately following the Business Meeting on Saturday morning, John S. Bugas, industrial relations vice-president, Ford Motor Co., Dearborn, Mich., addressed the 800 present for the Charles Edgar Hoyt Annual Lecture, top technical address of the Congress. A noted authority on the subject, Mr. Bugas provided a searching insight into the human relationships that are the backbone of successful industrial operations in his talk on *"Frontiers in Industrial Relationships."*

Saturday evening, the International Banquet attracted nearly 1200 foundrymen and their ladies, who enjoyed a filet mignon dinner with wines served in the Continental manner.

Following dinner were presentation of A.F.S. Gold Medals and Honorary Life Memberships and the International Award of Honor. Climaxing the Banquet was a 2-hour stage show.

President Seelbach announced during the banquet that the 1953 A.F.S. Convention would be held in Chicago May 4 through 8.

Sunday, May 4, the Foundry Show was thrown open free of charge to all foundrymen from the Chesapeake, Metropolitan, and Philadelphia chapter areas. Also on Sunday's agenda were meetings of A.F.S. tech-

Above, top to bottom: A.F.S. President Walter L. Seelbach welcomes delegates from overseas to the International Foundry Congress. Chester V. Nass, Beardsley & Piper, Chicago, president, National Castings Council, officially opens the Congress at 11:00 a.m., Thursday, May 1. John S. Bugas, Ford Motor Co., Dearborn, Mich., delivering the Charles Edgar Hoyt Annual Lecture.

nical committees and the International Foundry Technical Association Committees. In the late afternoon, A.F.S. was host to all overseas foundrymen attending the Congress at the International Reception in the Ambassador Hotel's Renaissance Room. That evening the three A.F.S. Canadian chapters held their traditional annual get-together at the Canadian Dinner.

Monday, May 5, busiest day of the Congress, featured the Annual A.F.S. Alumni Dinner. This year, for the first time, the Alumni invited all foundrymen and their ladies to attend in recognition of the importance of the guest speaker to the foundry industry and to industry in general. Principal speaker was William J. Grede, president, Grede Foundries, Inc., Milwaukee, foundryman president of the National Association of Manufacturers. Mr. Grede discussed the economic position of American industry in the world of today in his talk on *"Our Free Enterprise."*

Of worldwide foundry interest was the International Education Dinner, Tuesday evening, May 6, when foundrymen of many nations met to compare notes on bringing "new blood" into the metal castings industry and to hear speakers Noel Newman and Tom Makemson, past president and secretary, respectively, of the Institute of British Foundrymen discuss foundry education.

Many foundry technical and trade organizations held their annual meetings concurrently with the A.F.S. International Foundry Congress & Show. Among them were the Non-Ferrous Founders' Society, trustees of the Foundry Educational Foundation, the National Castings Council, and the International Committee of Foundry Technical Associations.

Hundreds of foundrymen took advantage of the week-long program of plant visitations arranged by the A.F.S. Philadelphia chapter. More than a score of ferrous and nonferrous foundries producing many types of castings with a wide variety of methods were available for inspection, as were a coke plant and ten foundry sand producing companies in the Atlantic City area. Special trips by chartered buses were arranged and sponsored by the sand companies on May 2 and 6.

Program for the entertainment of the more than one thousand ladies who attended the 1952 International Foundry Congress & Show was designed to supplement the natural attractions of Atlantic City and included a reception tea, musicale, and an International Luncheon and Fashion Show with music, entertainment, and a showing of latest styles by exclusive Boardwalk shops.

On the technical side, supplementing the week-long program of technical sessions, were shop courses, round table luncheons, symposia, panel discussions, and other events.

Papers by metal casting authorities from Australia, Belgium, England, France, India, Italy, the Netherlands, Norway, and Sweden contributed a truly international flavor to the technical program of the 1952 Congress. Facilitating the discussion of overseas papers was Hans J. Heine, Rockwell Mfg. Co., Barberton, Ohio, whose technical background and command of several languages were most helpful.

Thursday, May 1

Registration for the 1952 International Foundry Congress & Show began at 8:30 a.m., Thursday, May 1, and an hour later the Foundry Show opened its doors. Simultaneously, the first of several annual meetings of technical societies held in conjunction with the Congress, that of the Non-Ferrous Founders' Society, was held under the chairmanship of J. D. Zaiser, Ampco Metal, Inc., NFFS president.

Opening ceremony

Official Congress Opening Ceremony was inaugurated by C. V. Nass, Beardsley & Piper Co., Chicago, who as president of the National Castings Council welcomed Congress attendants from the balcony of Atlantic City's huge Auditorium. Flanked by distinguished foundrymen representing member groups of the International Committee of Foundry Technical Associations, Mr. Nass told delegates their presence typified the spirit of cooperation and free interchange of

ideas upon which A.F.S., the International Committee of Foundry Technical Associations, and the Exhibit were built.

Tom Makemson, secretary, Institute of British Foundrymen and Honorary Secretary, International Committee of Foundry Technical Associations, introduced overseas visitors. Dr. Marcel Ballay, vice-president, French Foundry Technical Association, responded for the group.

Introduced by Mr. Nass as "Mr. Responsibility" for the success of the 1952 International, A.F.S. President Seelbach also welcomed delegates.

Lead-off technical event of the Congress, the Brass & Bronze Round Table Luncheon was held at noon in the Hotel Traymore's Rose Room, with B. A. Miller, Baldwin-Lima-Hamilton Corp., Philadelphia, presiding and H. L. Smith, Federated Metals Div., American Smelting & Refining Co., Pittsburgh, as co-chairman. *"Practical Problems—Take Your Pick,"* round table discussion following the luncheon, covered synthetic sands, cause and cure of "zinc worms," and ingot vs. virgin metals. Speaking from the floor, foundrymen cited resistance to change, reluctance to purchase equipment and control difficulties as reasons for preferring natural sands. In reply, one man said he changed to synthetic sand after 30 years of using natural sand and now achieves far better control.

First Congress technical session, at 2:00 p.m., May 1, was on Aluminum & Magnesium, with Anthony Cristello, American Light Alloys, Inc., Little Falls, N. J., presiding and H. E. Elliott, Dow Chemical Co., Bay City, Mich., as session co-chairman.

First speaker D. L. LaVelle, American Smelting & Refining Co., Barber, N. J., in discussing *"Aluminum Sand Casting Defects—Their Identification, Causes, and Corrections"* said that such defects commonly fall into seven major classifications: surface defects, brittle fracture, inclusions, blows, cracks, shrinkage, and internal porosity. In describing these defects and their variations, Mr. LaVelle said that correct identification of defects and subsequent remedies are the most important factors in improving casting quality. He urged that foundrymen make a thorough study of these defects and their causes as a means of advancing the industry and its product.

Speaking on *"Heat Treatment of Magnesium Alloy Castings,"* E. M. Gingerich, Aluminum Co. of America, Cleveland, described the four types of heat treatment in common commercial usage: solution heat treatment, artificial aging, solution treatment followed by artificial aging, and solution followed by stabilizing. These, he said, affect such mechanical properties as tensile and yield strengths, elongation, ductility, hardness and resistance to impact in varying degrees. In addition, Mr. Gingerich said, heat treatments can be used to relieve casting or quenching stresses and to obtain dimensional stability in castings.

Mr. Gingerich went on to describe similarities and differences between heat treating of magnesium and that of other light metals. Temperatures for heat treating magnesium alloys are similar to those of other light metals in that they are just below the temperatures at which eutectic melting is encountered under commercial conditions, he concluded.

"Alloying Zirconium to Magnesium," a paper by W. P. Saunders and F. P. Strieter of Dow Chemical Co., Midland, Mich., reported results of an investigation to find which zirconium compounds are suitable for alloying zirconium to magnesium. Mr. Saunders made the presentation. Among materials found suitable are zirconium sponge, $ZrCl_4$, ZrF_4, and a master alloy made by reacting magnesium to $ZrCl_4$ which alloys readily, possesses no excess salt constituents, and is readily available for foundry use.

Factors to be considered in choosing an agent are raw material costs, labor of alloying, operating temperatures, reactivity of salt residues, and maintenance costs, the speaker said.

Second Thursday Aluminum & Magnesium session, at 4:00 p.m., had as its chairman Hiram Brown, Solar Aircraft Co., Des Moines, with Walter E. Sicha, Aluminum

Tom Makemson, Secretary, Institute of British Foundrymen, introduces overseas delegates at Official Opening Ceremony.

Co. of America, Cleveland, as co-chairman.

Co-authors H. Rosenthal and S. Lipson of Pitman-Dunn Laboratories, Frankfort Arsenal, Philadelphia, in their paper on *"Investment Casting of Aluminum"* reported on the second phase of an investigation into mechanical properties of aluminum test bars produced by investment casting. An Al-Si alloy (ASTM S5A) and an Al-Si-Cu alloy (ASTM S64A) were found to have properties similar to those of test bars produced by sand casting.

Values for the ASTM S5A bar ranged from 20,000 psi tensile strength and 9 per cent elongation at the lowest casting temperature (1175 F) to 15,500 psi and 5 per cent for metal cast at 1615 F and were improved by use of chills and modification of the melt just before pouring. S64A alloy developed 23,000 psi tensile strength and 3.8 elongation when poured at 1210 F and was found relatively insensitive to pouring temperature. It was necessary to melt out wax in saturated steam to use the lower mold temperature needed in making aluminum investment castings.

R. F. Dalton of United States Gypsum Co., Chicago, speaking on *"Some Practical Applications of Permeable Metal Casting Plaster,"* described the entraining of air into a formulated plaster mix, thus creating mold permeability by connections between tiny air cells. This cellular mold structure, Mr. Dalton said, is made by mixing the plaster by means of a rapidly rotating rubber disc. Thus, the speaker concluded, the most common objection to plaster molds—low permeability—requiring high-temperature burnout and pressure casting methods—are met with permeable plaster.

First of the Sand Shop Courses, at 4:00 p.m., Thursday, had W. B. Scott, National Bearing Div., American Brake Shoe Co., Meadville, Pa., and J. W. Clarke, General Electric Co., Erie, presiding.

Discussing *"Synthetic vs. Naturally Bonded Sands"* was a panel composed of F. S. Brewster, Harry W. Dietert Co., Detroit; Clyde A. Sanders, American Colloid Co., Chicago; Howard F. Taylor, Massachusetts Institute of Technology; and H. H. Fairfield, Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

The panel covered such phases of this ever-recurring foundry debate as grain distribution, semi-synthetic compounds, control advantages and disadvantages, synthetic and natural sand practices.

It was concluded by the panel that if foundrymen had the background in using synthetic sand that they have in natural sand, many of today's problems would not exist. The panel's consensus was that synthetic sand offers better control.

Concluding event of Thursday's program was the Non-Ferrous Founders' Society's *"Let's Get Acquainted"* Dinner, held in the Rose Room of the Hotel Traymore. NFFS President J. D. Zaiser of Ampco Metal, Inc., Milwaukee, presided at the dinner, which is the successor to the NFFS *"Son-Father"* Dinner held during previous A.F.S. Conventions. Election of officers and directors was announced at the dinner.

Friday, May 2

Program for Friday, May 2, "Chapter Day," began with opening of the Foundry Show at 9:00 a.m. At 9:30 a.m. plant visitation groups left by chartered buses for a day-long tour of New Jersey's famous foundry sand deposits.

Aluminum & Magnesium session led off Friday's technical program under the co-chairmanship of Walter J. Klayer. Aluminum Industries, Inc., Cincinnati, and R. C. Boehm, Wellman Bronze & Aluminum Co., Cleveland.

Discussion of *"Mechanical Properties of Sand Cast Magnesium-Zinc-Zirconium Alloys,"* by J. F. Hildebrand and F. P. Strieter of Dow Chemical Co., Midland, Mich., was largely devoted to a magnesium alloy containing about 5 per cent zinc and 0.7 per cent zirconium (proposed ASTM designation

At the A.F.S. Annual Business meeting President Walter L. Seelbach awards prizes and certificates to five top winners in the 1952 Apprentice Contest. From left they are: Robert P. Schmidt, Gray Iron Molding; Henry C. Grube, Steel Molding; Fernand Lemieux, Non-Ferrous Molding; David L. Schroeder, Wood Patternmaking; and Luther R. Hardin, Metal Patternmaking. Contest details on page 64.

ZK51A). This alloy, Mr. Hildebrand said, attains good properties with only an aging treatment and has a high ductility-yield strength ratio. However, its potential uses in casting are more or less limited to applications where a combination of ductility and strength are needed. This is because of the high cost of the alloy, the speaker said, and its tendency to produce surface imperfections. Thus, he concluded, extensive commercial use of ZK51A is not warranted now.

Charles Maxwell of Christiansen Corp., Chicago, speaking on *"High-Strength Non Heat-Treated Aluminum Casting Alloys,"* told his audience that the designer of aluminum alloy castings must either make sections heavy for greater safety, or choose the strongest alloy available. The best alloys for this purpose, according to Mr. Maxwell, are of the Al-Mg-Zn type. These alloys attain the same or higher properties without heat treatment as do heat-treatable casting alloys and have dimensional stability, excellent machinability, high luster, and resistance to corrosion. Although the Al-Mg-Zn alloys require exacting foundry practice and are expensive, their high properties and ability to be brazed make them a quality casting material, Mr. Maxwell concluded.

Speaking on *"Zinc in Aluminum Casting Alloys,"* Donald L. Colwell of Apex Smelting Co., Chicago, said that zinc can be allowed up to as much as one-half per cent in copper-free silicon alloys without affecting mechanical properties or corrosion resistance. Both in the as-cast and heat-treated conditions, addition of zinc in excess of most current specifications to common copper-silicon alloys improves machinability, lowers costs, and produces castings of superior strength and corrosion resistance. These properties more than compensate for the extra precautions required in casting alloys of high zinc content, Mr. Colwell said.

Two papers were presented at the 10:00 a.m., May 2, Brass & Bronze session. Session chairman was George P. Halliwell, H. Kramer & Co., Chicago, with H. J. Roast, foundry consultant, London, Ont., as co-chairman of the session.

First session paper, *"Effects of Gating Practice on Leak Tightness of 85-5-5-5 and 81-3-7-9 Alloy Castings,"* was presented by J. G. Kura, Battelle Memorial Institute, Columbus, and L. W. Eastwood, Kaiser Aluminum & Chemical Corp., Spokane, Wash. According to Mr. Kura, it is desirable to gate experimental leak-test castings at the bottom. This, although differing from some commercial practice, eliminates the turbulence that occurs when the melt is introduced at the top of the mold cavity. In these experiments, they reported, castings were poured in natural green sand and duplicate 300-lb melts of each alloy were made.

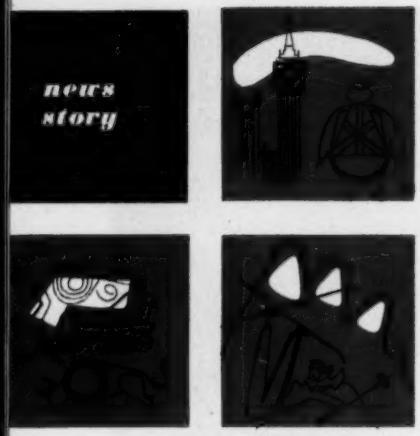
A.F.S. Secretary-Treasurer Wm. W. Maloney speaking at the Society's Annual Business meeting, Saturday, May 3.

Mrs. Walter L. Seelbach of Cleveland, First Lady of A.F.S., presenting the first cup of tea to Mrs. Frank J. Coyle of Detroit during the Society's Ladies Tea and Reception, held Friday afternoon, May 2, in the American Room of the Hotel Traymore, Atlantic City. Over 1,000 ladies of the foundry world attended the Congress and enjoyed a full week's program of social and recreational events.

In one gating technique used, the gates entered the bottom of the casting and in the other two methods, gates entered the top of the casting, one of which was equipped with a small top riser. Defects causing leaks were found to be shrinkage, microporosity, dross, and gasholes. These defects occurred most frequently in the top-gated castings, according to the author, who stated that fewer leakers are obtained if intermediate pouring temperatures of about 2075 F are used.

First of nine Exchange Papers from foreign lands was presented at this session by Ake V. Larsson, AB Svenska Metallverken, Vasteras, Sweden. Official Exchange Paper from the Foundry Section, Federation of Swedish Mechanical Engineering Industries, Mr. Larsson's *"Influence of Aluminum on Properties of Cast Gun Metal and Removal of Aluminum by Slag,"* reported investigations undertaken recently in Sweden.

Most efficient aluminum removing agents, according to Mr. Larsson are: (1) slag with 30 per cent NaF, 20 CaF_2, 20 Na_3AlF_6, 20 Na_2SO_4, 10 Na_2CO_3; (2) slag with 70 per cent CaF_2, 10 Na_2CO_3; and (3) slag with 25 per cent NaF, 15



CaF_2, 15 Na_3AlF_6, 15 Na_2SO_4, 10 Na_2CO_3 and 20 MnO_2. A content of 0.3 per cent aluminum in gun metal or 80-85 per cent brass can be brought under 0.01 per cent in 10 min by adding 1.5 per cent slag. Silicon can also be removed by treating the melt with slag, he concluded.

First Pattern session of the Congress, under the chairmanship of E. T. Kindt, Kindt-Collins Co., Cleveland, and Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit, began at 10:00 a.m., Friday, May 2, with a talk on *"Core Boxes from Core Plugs,"* by James N. Mathias, Accurate Match Plate Co., Chicago.

Interest has increased greatly in recent years in aluminum core boxes made from wood or metal master core plugs, Mr. Mathias said. The advantages are: (1) greater accuracy because the same amount of shrinkage can be allowed for both master pattern and core plug; (2) master core plugs usually can be made in less time than a core cavity; (3) the master core plug can be proved in a plaster mold of the master pattern, eliminating making of plaster plugs from core box cavities; (4) process eliminates making of wood master drier patterns; and (5) one master plug is usually sufficient for multigang boxes. In addition, Mr. Mathias said, the smooth surfaces and dimensional accuracy inherent in this process can eliminate or reduce machining time.

Second session speaker M. K. Young, United States Gypsum Co., Chicago, in discussing *"Pattern-making to Compensate for Shrink Allowance"* advocated use of medium-high and high expansion gypsum cements to compensate for shrink allowance in patternmaking. These expanding plasters, according to Mr. Young, offer a combination of accuracy, expediency, and economy to the patternmaker, particularly in instances where standard equipment is being converted for shell molding.

The speaker went on to describe characteristics and properties of high-expansion cements, mixing of cements, how to remove casts from patterns, techniques for expanding patterns, and gave an overall picture of gypsum sand molding.

Cite olivine uses

Sand session at 10 a.m., Friday, May 2, had as its chairman and co-chairman C. C. Sigerfoos of Michigan State College and Victor M. Rowell of Archer-Daniels-Midland Co., Cleveland.

Lead-off session paper, *"Olivine Application in the Foundry,"* was given by G. S. Schaller of the University of Washington, Seattle. Prof. Schaller reported on results of the University of Washington's recent investigations into foundry uses of olivine, found in large deposits in Washington.

The investigation showed that olivine has a fusion point of about 3300 F, adequate to meet almost all foundry requirements. Its low thermal expansion rate is a desirable factor in eliminating buckling and scabbing. Olivine, Schaller continued, has a thermal conductivity midway between that of silica and silicon carbide. Its comparatively high specific gravity is unfavorable in that it makes molds weigh more than those of other molding sands, but on the other hand a heavier mold aggregate aids jolt ramming.

Olivine, according to the speaker, is a basic refractory and reacts to aluminous materials and silica. Olivine does not contain free silica, he said and went on to describe olivine grain size classifications, usage and mulling effects, and told of possible applications for olivine in shell molding, as a core sand, and as a lining for ladles and cupola spouts.

"Mechanism of Bonding in Foundry Molding Sands," presented by Loris M. Diran and Howard F. Taylor of the Massachusetts Institute of Technology, began with a comparison of properties of naturally bonded and synthetic molding sands, and went on to explain the soil mechanics involved in development of green bond strength and dry bond strength in molding sands. Mr. Diran presented the paper.

Sand-clay mixtures are complex aggregates, the speaker said, and a really basic interpretation of bonding action must be developed before molding mixtures can be improved to any great degree. The technology of siliceous aggregates is only partially developed and it

Talking Society shop during the Chapter Officers and Directors Dinner the evening of May 2 were, from left: A.F.S. Vice-President Elect Collins L. Carter; Michiana Chapter Chairman S. F. Krzeszewski, American Wheelabrator & Equipment Corp., Mishawaka, Ind.; A.F.S. President Elect I. R. Wagner; and Chesapeake Chapter Chairman Allen S. Kittrell, Leach Pattern Shop, Baltimore.

would be well for foundrymen to keep abreast of research work and to contribute their practical knowledge of the subject to that of the technician in the hope that a fundamental idea for improving uses of foundry sands and clays may be developed.

Official Exchange Paper from the Norwegian Foundrymen's Association, "*Practical Aspects of Olivine as a Molding Material*," by John Sissener and Bjorn Langum of A/S Myrens Volkstad, Oslo, Norway, told how olivine has been used in Norwegian foundries since 1927 as a molding material. Principal advantage of olivine, according to Mr. Sissener, is that it diminishes the risk of silicosis.

Olivine, Mr. Sissener continued, is a neutral or even slightly basic material and is highly refractory. It will withstand great changes in temperature and has given good results as a molding material for steel castings, particularly because it imparts an excellent surface to manganese and high chromium steel castings.

Western bentonite has proved to be the best binder for olivine and castings have been poured up to 15 tons in olivine-bentonite molds. So far, Mr. Sissener concluded, olivine has been used with greatest success in steel foundries. Its applications in non-ferrous and gray iron foundries have not as yet been conclusively established.

Aluminum & Magnesium Round Table Luncheon, held Friday noon in the Venetian Room of the Ambassador Hotel, was devoted to a panel discussion of "*Sand Casting Practice for Aluminum and Magnesium Alloys*" with Walter E. Sicha, Aluminum Co. of America, Cleveland, as chairman.

T. D. Stay, Reynolds Metals Co., Cleveland, led discussion on aluminum casting practice, and C. C. Hitchcock, R. C. Hitchcock & Sons, Minneapolis, was leader of the discussion on magnesium casting.

Subjects covered in the discussion included metallurgy, test bar fractures, whether or not laboratory tests can prove metal or pouring causes porosity, use of chills, high-temperature oxidation, heat treating, and application of the shell molding process to casting of aluminum.

Pattern Luncheon

Pattern Round Table Luncheon in the Ambassador Hotel's Embassy Salon had as its chairman E. T. Kindt, Kindt-Collins Co., Cleveland, with Albert F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, as co-chairman.

First luncheon speaker F. W. Burgdorfer, Missouri Pattern Works, St. Louis, discussed a "*Pattern Apprentice Training Program*," in which he told of the work of the St. Louis Pattern Manufacturers' Association in developing a modern, effective pattern apprentice training program.

Activities of the Association's Joint Apprenticeship and Training Committee have been manifold, Mr. Burgdorfer said. Among these are screening of apprenticeship applicants, supervision of vocational school courses, periodic apprentice examinations, and making training recommendations to employers. The committee also maintains a comprehensive free lending library covering fundamentals of all phases of foundry work. Mr. Burgdorfer urged that patternmaking groups of other areas adopt the basic program established in St. Louis—a program that has more than paid off in the quality of journeyman patternmakers it has produced.

H. J. Jacobson, Industrial Pattern Works, Chicago, speaking at the luncheon on "*New Methods in Metal Patternmaking*," said that today's high production molding machines call for duplicate patterns made to within plus or minus tolerances of 0.002 inches in all three dimensions. One method of accomplishing this, Mr. Jacobson said, is to deposit copper plating material into a mold made from a master, then back the thin copper plate with non-shrinking white metal. This is extremely accurate but costly.

Newest and least expensive method is pressure casting in plaster molds. This method, he said, has the added advantage of accurately duplicating patterns to replace worn-out or damaged patterns inexpensively. The speaker went on to describe the importance of proper driers in production pattern equipment and in conclusion urged that high-production patterns be called "impression dies" as a means of distinguishing them from other patterns and avoiding confusion in establishing pattern costs.

Brass & Bronze session at 2:00 p.m., Friday, May 2, had C. A. Robeck, Gibson & Kirk Co., Baltimore, presiding and B. F. Shephard, Ingersoll-Rand Co., Phillipsburg, N. J., as co-chairman. Mr. Robeck opened the session by announcing a paper from France by title, "*Refining and Elimination of Gases from Metals and Alloys*," by H. Lepp, F. Monneret and P. Rame.

"*Effects of Mold Materials on Leak Tightness and Mechanical Properties of 85-5-5-5 and 81-3-7-9 Alloy Castings*," by J. G. Kura, Battelle Memorial Institute, Columbus, and L. W. Eastwood, Kaiser Aluminum & Chemical Corp, Spokane, Wash., was the first session paper.

Messrs. Kura and Eastwood's pa-

Top sand technicians getting together at the Thursday Sand Shop Course were, left to right: H. H. Fairfield, Wm. Kennedy & Sons, Owen Sound, Ont.; Howard F. Taylor, Massachusetts Institute of Technology; Frank S. Brewster, Harry W. Dietert Co., Detroit; and Clyde A. Sanders, American Colloid Co., Chicago, chairman of the Society's Sand Division.

per was a progress report on research undertaken at Battelle for the Brass & Bronze Ingot Institute in evaluating effects of mold materials primarily by measurement of leak tightness, density, and mechanical properties. Eight 300-lb heats of 85-5-5-5 and six 300-lb heats of 81-3-7-9 alloy were prepared by different methods to produce melts varying from very good to very poor. Melts were cast into test bars and leak-test cylinders, four per mold, employing (1) calcined clay baked at 1600 F and cooled to 300 F, (2) natural green sand, (3) coated sand, (4) synthetic sand bonded with bentonite and baked at 450 F, and (5) green synthetic sand bonded with bentonite.

Inert calcined clay molds produced test specimens with highest tensile properties, and leak-test cylinders with highest density and lowest percentage of leakers, the speaker said.

Based on occurence of leakers at 1300 psi, the following is the order of decreasing merit of the five mold materials tested: For 85-5-5-5 (1) calcined clay, (2) coated sand, (3) baked synthetic sand, (4) natural green sand, (5) green synthetic sand. For 81-3-7-9 (1) calcined clay, (2) baked synthetic sand, (3) coated sand, (4) natural green sand, and (5) green synthetic sand.

Results showed that melts prepared under reducing conditions produce fairly sound castings in calcined clay but unsound castings with the other four materials, the speaker concluded.

A.F.S. Research report

Progress report of the A.F.S. Brass & Bronze Division Research Project at the University of Michigan, *"Fracture Characteristics and Melt Quality of 85-5-5-5 Red Brass and Other Copper-Base Alloys,"* was presented by Clarence Upthegrove, University of Michigan, and F. B. Rote, Albion Malleable Iron Co., Albion, Mich.

Investigations at Michigan have shown that the fracture test can be used to predict melt quality with a reasonable degree of accuracy, the speaker said, but this accuracy depends to a great degree upon the human factor. Thus, one of the problems facing the industry is development of a standard fracture test for evaluating melt quality. This is difficult, according to the speaker, because alloy colors and appearance change appreciably when exposed to ordinary atmospheres for even short periods. Messrs. Upthegrove and Rote claim that use of colored slides of type fractures in a viewing box offer the best solution to date.

A method has been developed for obtaining a fracture block and interpreting it in terms of melt quality in less than 3 minutes. This method is applicable to all copper-base alloys, they stated.

Malleable and Refractories session at 2:00 p.m., Friday, May 2, had W. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich., presiding and Eric Welander, Union Malleable Iron Works, East Moline, Ill., assisting.

Session began with a paper by C. W. Meyer, Saginaw Malleable Iron Plant, GMC, Saginaw, Mich., on *"Refractory Practice as Applied to Malleable Duplexing."* Mr. Meyer told of his experiences at Saginaw Malleable with various types of refractories for malleable melting and metal handling. Monolithic refractories have proved satisfactory for lining cupolas, forehearths, and transfer ladles, he said, and explained how three-phase acid electric furnaces are lined and furnace roofs constructed at Saginaw.

William C. Corbeau, National Malleable & Steel Castings Co., Cleveland, next took up the subject of *"Air Furnace Refractory Practice in Cupola Air Furnace Duplexing."*

Mr. Corbeau covered air furnace dimensions, laying of bottom and side walls, refractory consumption data and repairs. For construction of new furnaces, Mr. Corbeau recommended the following changes in present practice: (1) widen the air furnace bath several times for more efficient heating; (2) install an air-cooled or ventilated air furnace bottom for more economical use of bottom brick; and (3) divide the common stack at the base to permit ash-removal and stack repair during working hours instead of during premium-time over the week end or on holidays.

Final session paper was that of Carl O. Schopp and P. F. Ulmer, Link-Belt Co., Indianapolis, on *"Refractory Selection Applied to Batch Type Air Furnaces,"* in which the authors outlined results of many years of trial-and-error testing of refractories under actual operating conditions at their plant. Among their recommendations are: hard-burned stiff-mud process brick made of Missouri clay for sidewalls; bung section brick of dry-pressed Kentucky clay; silica sand furnace bottoms; and tapping blocks of Kentucky clay. These refractories, while most satisfactory at the Link-Belt plant, may be costly to other plants because of expense of transportation. Thus, the speaker concluded, the real test of a refractory is whether it is

Talking over a topic of vital interest to all foundrymen at the Saturday morning Safety & Hygiene & Air Pollution session were, left to right: A.F.S. National Director A. L. Hunt, American Brake Shoe Co., St. Louis; Kenneth M. Smith, Caterpillar Tractor Co., Peoria, Ill.; H. J. Weber, American Brake Shoe Co., Chicago; and Chester K. Faunt, Christensen & Olsen Foundry Co., Chicago.

the most economical material that will stand up under the desired cycle of foundry operations.

A.F.S. Sand and Brass & Bronze Divisions were joint sponsors of the 4:00 p.m., May 2, Sand Shop Course. Presiding over a *"Symposium on Shell Molding"* were B. N. Ames, New York Naval Shipyard, Brooklyn, and G. M. Etherington, American Brake Shoe Co., Mahwah, N. J. Discussion leaders were Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit; R. W. Crannell, Lehigh Foundries, Inc., Easton, Pa.; N. A. Kahn, New York Naval Shipyard, Brooklyn; E. N. Harrison, Econocast, Inc., Chattanooga; and H. K. Salzberg, Borden Co., Bainbridge, N. Y.

This was the most heavily attended technical session of the Congress, aside from the Hoyt Lecture. Foundrymen heard latest operating information on shell molding from foundrymen, equipment producers and resin suppliers. One of industry's major concerns, deciding whether to cast a certain job in shells, was covered by Mr. Reid. Machining and scrap are considerably reduced or eliminated in shell molding, he said, and much of the labor of producing a finished part is removed from the foundry.

Climaxing Friday's program was the traditional A.F.S. Chapter Officers and Directors Dinner, held in the Belvedere Room of the Hotel Traymore. President Elect I. R. Wagner, who presided, paid tribute to the work of chapter officers and directors for the success of A.F.S. programs and activities. The 1952 Chapter Officers Conference will be held in Chicago June 12 and 13, he announced. Other speakers included L. N. Shannon, vice-president, International Committee of Foundry Technical Associations; President Seelbach, Vice-President Elect Collins L. Carter; and H. F. Scobie, editor, AMERICAN FOUNDRYMAN.

Secretary-Treasurer Maloney discussed chapter membership goals, and IBF Secretary Tom Makemson told of makeup and operation of the Institute of British Foundrymen.

Saturday, May 3

The Foundry Show and other Congress activities were suspended until noon on Saturday for two of the most important events of the foundry year—the Annual Business Meeting of A.F.S. and the Charles Edgar Hoyt Annual Lecture.

The Annual Business meeting began at 9:30 a.m. in the Ballroom, Convention Hall, with A.F.S. President Walter L. Seelbach welcoming foundrymen from many lands.

Mr. Seelbach, in the President's Annual *"State of the Society"* Address, described the workings of the Society. Among its many activities, he said, are collection and dissemination of technical information, foundry research projects, publication of technical books and AMERICAN FOUNDRYMAN, and conducting the biennial Foundry Show.

Mr. Seelbach told of the Society's seven current foundry research projects, four new publications, new film on fluid flow, and of its chapter activities in many fields.

In conclusion, Mr. Seelbach told of plans for the new A.F.S. Headquarters, and cited the industry-wide Safety & Hygiene & Air Pollution Program being undertaken by A.F.S. at industry request. This program, Mr. Seelbach said, cannot be allowed to lag, because it is too important to every foundry.

Following this, Mr. Maloney announced election of new A.F.S. Officers and Directors. (See page 61). Educational Division Chairman George J. Barker, University of Wisconsin, described educational activities of the Society. Next, President Seelbach introduced the five top winners of the 1952 A.F.S. Apprentice Contest, presenting each with a cash prize and certificate.

President Seelbach then introduced the distinguished overseas guests sharing the platform with him. Robert Crigniez of Belgium responded on behalf of all overseas delegates. Mr. Crigniez's remarks were translated into English by Vincent Delport of London: "We shall return home, inspired by the invaluable knowledge that our American friends have passed on to us without stint. Please accept our thanks and sincere appreciation."

Who says it can't be Dunn? William Dunn, Western Pattern Works (left), Montreal, a director of Eastern Canada chapter, and William Dunn, Oberdorfer Foundries, Inc., Syracuse, N. Y., Central New York chapter chairman, met for the first time at the Chapter Officers and Directors Dinner on Friday, May 2. A quick rundown of possible mutual ancestors revealed they were no relation.

Hoyt Lecture

Immediately following the Annual Business Meeting, at 11:00 a.m., John S. Bugas, Ford Motor Co., Dearborn, Mich., presented the Charles Edgar Hoyt Annual Lecture, top technical talk of the Congress, to an audience of more than 800.

Speaking on *"Frontiers in Industrial Relations,"* Mr. Bugas said that industry must do its part in combatting Communism and Socialism.

This, he said, can be accomplished in many ways—keeping the door of opportunity open to all, improving management-employee relationships, keeping the public informed of its work, encouraging initiative, and playing an active part in community life.

Mr. Bugas concluded by saying, "Democracy is a great idea. It isn't

an easy idea, pie in the sky, a free ride or an easy life—democracy is hard work and takes gumption and courage."

"The simple truth is that democracy pays. It does more for you than any other system men have yet been able to devise. Maybe it is a reminder that there is no easy way," Mr. Bugas concluded.

Pattern session at 2:00 p.m. opened Saturday's regular technical program. A.F.S. National Director V. J. Sedlon, Mastern Pattern Co., Cleveland, presided. H. C. Swanson, Arrow Pattern & Foundry Co., Chicago, served as co-chairman.

Wood patterns

Speaking on *"Practical Suggestions for the Building of Wood Patterns,"* W. H. Siebert, Elyria Foundry Division, Industrial Brown Hoist Corp., Elyria, Ohio, said that there is much more to modern pattern-making than haphazard guesswork. Patterns must be built to foundry specifications, he said, and must fulfill the designer's every requirement.

Mr. Siebert then proceeded to outline correct steps in making of wood patterns. Among his recommendations were: consult the foundryman who is to make the casting; put as many holes as possible in cope surfaces; don't skimp on lumber thickness; screw tie rails directly to outside of heads; avoid loose pieces where possible; make core-prints sufficiently large to carry weight of the core and permit solid anchorage; use as much pattern draft as the design will permit; always start the core box as a sturdy rectangular frame; insure that the outer shell of the box is well battened; and mark up pattern equipment in such a way that the foundry cannot get into trouble in setting up the job.

"Patterns for Malleable and Steel Foundries" was the topic of J. M. Kreiner, National Malleable & Steel Castings Co., Cleveland. Mr. Kreiner described design, construction and complete standardization of high-production pattern and core-box equipment. Mr. Kreiner used slides to illustrate pattern equipment designed for castings that had to interchange in an assembly with castings from eight different foundries.

H. J. Williams, New Jersey Silica Sand Co., Millville, N. J., presided at the 2:00 p.m., May 3, Sand Session. Stanton Walker, National Industrial Sand Association, Washington, D. C., was session co-chairman.

First session paper, *"Mineral Perlite and Its Uses in the Foundry,"* by E. D. Boyle and Harold R. Wolfer of Puget Sound Naval Shipyard, Bremerton, Wash., compared three types of insulating materials. Of these, gypsum presents problems of moisture pickup and possible sand contamination; sintered diatomaceous earth bonded with bentonite is generally satisfactory but is inferior to the third metal, mineral perlite, in non-ferrous insulation, according to the authors.

Perlite has many uses in the foundry, Mr. Boyle said. Among these are: (1) as insulation for collars, riser covers and pads, (2) in all molding sands, (3) as a molding sand inhibitor, (4) in core sands and coreblowing mixtures, and (5) as a powdered ladle covering.

Boyle concluded with a summary of the composition and chemical and physical properties of mineral perlite, stating that perlite is a relatively non-hazardous material from the viewpoint of foundry hygiene.

"Influence of Specimen Tube Loading and Riddle Size on Molding Sand Test Results," by D. I. Huizenga, Albion Malleable Iron Co., Albion, Mich., and K. E. Spray, U. S. Bureau of Ships, Washington, D. C., told of experiments using 13 different foundry sands, six natural and seven synthetic, in various-sized riddles.

Among recommendations made by Messrs. Huizenga and Spray were (1) check sand testing equipment periodically for wear, (2) follow identical procedures for each test, (3) mull and riddle samples according to standard operating procedures, and (4) test laboratory samples for shop tests by using same techniques as those in shop procedure.

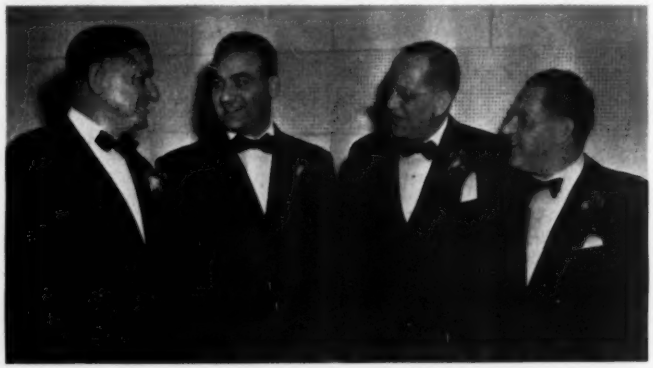
Official Exchange Paper of the Institute of Australian Foundrymen (Victorian Division), *"A Study of the A.F.S. Fineness Test,"* was presented by H. A. Stephens, Commonwealth Scientific & Industrial Research Organization, Melbourne.

Mr. Stephens outlined various sources of error in sieving, and said that research has shown that effects of oversize apertures and duration of sieving are important. Grading analyses on different sieve sets show large discrepancies in results for comparable sieves, Mr. Stephens said, due to only slight differences effective in aperture size.

The A.F.S. Fineness Number is a satisfactory index of average grain size, the speaker said, but recommended calculation of the maximum amount of sand remaining on three adjacent sleeves. This, he concluded, provides an index that is simple and contains all necessary information regarding fineness and distribution.

Aluminum & Magnesium session originally scheduled for 3:00 p.m., Saturday, May 3, was moved up to allow the session to be repeated. Chairman was R. F. Thomson, Research Laboratories Div., General Motors Corp., Detroit, with T. D. Stay, Reynolds Metals Co., Cleveland, as session co-chairman.

Session was devoted to the premiere showing of the new A.F.S.



Principals in the presentation of the International Award of Honor at the International Banquet were, from left: L. N. Shannon, vice-chairman of the International Committee of Foundry Technical Associations; Dr. Eugenio Mortara of Italy, who received the award on behalf of its recipient, the late Dr. Carlo Vanzetti of Italy; A.F.S. President Walter L. Seelbach; and Mario Olivo of Milan, Italy, donor of the replica of Cellini's *Perseus*, symbolizing the award.

Aluminum & Magnesium Division Research film, *"Effect of Gating Design on Casting Quality,"* presented by K. Grube and J. H. Jackson, Battelle Memorial Institute, Columbus, Ohio. Mr. Grube made the introductory comments and J. G. Kura, Battelle, handled the discussion of the film.

A color-sound picture, the film is the third in a series reporting results of A.F.S.-sponsored research at Battelle. The new film depicts best design for runners at and near the juncture of the runner and the sprue. Previous films showed the proper design of sprues and the design of ingates and runners.

Brass & Bronze session at 3:00 p.m. was headed by Chairman W. A. Mader, Oberdorfer Foundries, Inc., Syracuse, and Co-chairman B. W. Schafer, Kuhlman Electric Co., Bay City, Mich.

Opening session paper was *"Effect of Lead and Nickel on Grain Size of Certain Cast Copper-base Alloys,"* by R. A. Colton, F. L. Turk and D. L. LaVelle, American Smelting & Refining Co., Barber, N. J.

The paper reported results of experiments minimizing the cooling rate as a variable. Conclusions drawn by Messrs. Colton, Turk and LaVelle were that lead in pure copper in excess of 0.25 per cent has considerable grain refining influence; nickel contributes to refining of cast grain size when tin content is 7 to 8 per cent and nickel 2 to 3 per cent; presence of 1 per cent lead in a 5 per cent tin—5 per cent nickel copper-base alloy refines the grain as compared to a lead-free alloy; and lead refines the grain of several commercial copper-tin alloys, particularly binary copper-tin alloys.

"Use of Aluminum Bronze in High-Pressure Castings," by Thornton C. Bunch and George E. Dalbey of Mare Island Naval Shipyard, Vallejo, Calif., dealt with the possibility of substituting aluminum bronze castings for brass forgings and for gun metal in high-pressure heavy castings. Advantages of aluminum bronze, they stated, are that it successfully produces heavy, chunky castings, eliminating the marked density differences so often found in gun metal castings; aluminum bronze castings can be machined without sacrificing quality, and are uniformly dense. Aluminum bronze, however, must be gated for non-turbulent flow in order to produce dross-free and pressure-tight castings, they reported.

In the final session paper, *"Melting in a High-Speed Reverberatory Furnace,"* R. G. Carlson and W. B. Scott, National Bearing Div., American Brake Shoe Co., Meadville, Pa., told of their foundry's experiences with this type of equipment in melting copper-base alloys.

This type of furnace, according to Mr. Scott, is both fast and efficient and atmosphere control is similar to that of other open flame melting units. Refractory material, however, is subjected to severe operating conditions and presents a major maintenance problem, the speaker said.

Malleable session at 4:00 p.m., May 3, featured two papers by the same authors, A. E. Lange and R. W. Heine, University of Wisconsin. Mr. Lange presented the first paper, Mr. Heine the second. W. K. Bock, National Malleable & Steel Castings Co., Cleveland, and F. B. Rote, Albion Malleable Iron Co., Albion, Mich., were co-chairmen.

First paper, *"A Test for Hot Tearing Tendency,"* dealt with a testing procedure designed to evaluate inherent metal properties affecting hot tears. The authors concluded:

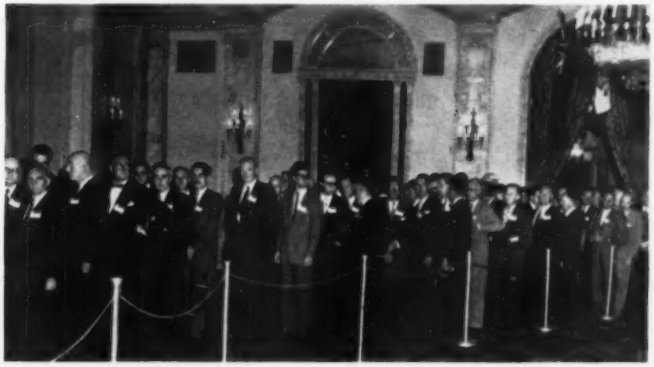
(1) Resistance to hot tears decreases as carbon percentage in white iron increases. (2) Less strain occurs prior to hot tear rupturing as carbon percentage increases. (3) Time interval from pouring to coherence increases with percentage of carbon. (4) Rate of test bar contraction after coherence develops increases with decreasing carbon.

(5) Test casting elongates under restraint during cooling. (6) Iron containing mottling visible in a fractured surface does not hot tear under the test conditions. (7) Micro-mottling occurs at carbon contents lower than those producing visual mottling and increases resistance to hot tearing.

In their paper on *"Effects of Melting Furnace Atmosphere on Fluidity, Hot Tearing Tendency and Other Properties of Malleable Iron,"* Messrs. Lange and Heine reported on progress of the A.F.S. Malleable Research Project.

Melting atmosphere can affect fluidity and hot tearing properties to a great degree, the speaker said. Two distinctly different relationships between fluidity and hot tearing tendency appear to exist, suggesting the possibility of two different freezing mechanisms influenced by the amount of carbon monoxide.

Among conclusions drawn by the authors were: no losses of silicon or manganese occur when melt is held at 2700 F in oxidizing, neutral,



Several hundred foundrymen, representing some 35 nations, were guests of the American Foundrymen's Society at the International Reception, held Sunday afternoon, May 4, in the Renaissance Room of Atlantic City's Ambassador Hotel.

What's New in Equipment

The new foundry tools feature "What's New in Equipment" originally scheduled for this and succeeding pages has been transferred to the June issue to make room for *American Foundryman's* extended news and picture coverage of the 1952 International Foundry Congress. "What's New in Equipment" will review the new developments displayed at this year's A.F.S. Foundry Show as seen by practicing specialists in various fields of foundry operation, from laboratory to cleaning room.

news story

McFadden Medalist Henton Morrogh, left, British Cast Iron Research Assn., is congratulated by Past President Sheehan, Institute of British Foundrymen.

Marcel Balley of France, left, proxy recipient of the Seaman Medal for Albert Portevin of France, with A.F.S. Awards Chairman Ralph J. Teetor.

or reducing atmospheres; hot tearing resistance decreases with increasing carbon content, providing micro-mottling does not occur at higher carbon levels; a hydrogen atmosphere introduced over the metal markedly increases resistance to hot tearing; and metal melted under hydrogen and water vapor atmospheres result in extensive pinholing in the well of the fluidity test casting.

S&H&AP session

First of three Safety & Hygiene & Air Pollution sessions, held under the sponsorship of the A.F.S. Safety & Hygiene & Air Pollution Committee in conjunction with the Society's long-range program, took place at 4:00 p.m., Saturday, May 3. Session chairman was A. L. Hunt, National Bearing Division, American Brake Shoe Co., St. Louis, with C. K. Faunt, Christensen & Olsen Foundry Co., Chicago, as co-chairman.

"Ventilation at Non-Ferrous Melting and Pouring Operations," presented by Herbert J. Weber, American Brake Shoe Co., Chicago, took up the legislative, hygienic, and labor relations aspects of foundry ventilation. Discussed by Mr. Weber as sources of contamination were uncovered crucibles, pouring spouts of reverberatory furnaces, barrel furnaces, and cupolas.

In many instances, the danger from toxic fumes can be offset at practically no expense, Mr. Weber said, citing the use of an ordinary garbage can lid placed over a crucible as an example. Mr. Weber showed slides of inexpensive, practical installations that have proved effective in ventilating non-ferrous melting and pouring operations.

Kenneth M. Smith, Caterpillar Tractor Co., Peoria, Ill., speaking on *"How to Maintain Foundry Ventilation and Dust Collecting Systems,"* said that a well-planned and operated program of preventive maintenance not only provides healthier working conditions, but permits full use of production equipment in the foundry.

Effective maintenance of foundry ventilation and dust collecting systems is dependent upon three factors, Mr. Smith said—(1) systems must be of rugged design, (2) all systems must be installed with the thought "Be sure this part can easily and quickly be replaced or cleaned", and (3) establishment of a routine procedure for observation and care of all existing systems by competent personnel.

Mr. Smith also recommended that designers of ventilation systems provide enough room for convenient installation, cleaning or removal of any system part, whether it is a hood, duct, dust collector, part, fan or motor. Mr. Smith concluded by telling how to install and maintain fans, ducts, hoods, air heaters, and all types of dust collectors.

Concluding Saturday's technical program was a Sand session at 4:00 p.m., with O. J. Myers, Archer-Daniels-Midland Co., Minneapolis, presiding and W. G. Parker, Elmira Foundry Co., Elmira, N. Y., as session co-chairman.

Lead-off session paper was that of Georges Ulmer and Maurice DeCrop, Centre Technique des Industries de la Fonderie, Paris, France, on *"Influence of Oven Atmosphere on Drying of Molds and Baking of Cores."*

Composition of oven temperature is secondary to atmosphere temperature, the speaker said. An ordinary core oven, because of the intake of air through the joints, contains enough oxygen to oxidize the binder, the speaker continued. In mold drying, superheated steam produces a regular and gentle drying that reduces crack formations.

→ **Almost 1200 foundrymen and their ladies, those lucky enough to get tickets for the sellout International Banquet, provided a glittering audience for one of the most outstanding social events in the history of A.F.S.**

Co-Simpson Medal Recipients Albert P. Ganebin, left, and Keith D. Millis, both of International Nickel Co., congratulate each other on their joint award.

Awarded Honorary Life memberships at the Banquet were A. I. Krynitsky, left, National Bureau of Standards, and William G. Mixer, retired foundryman.

Penton Medalist Frank G. Steinebach, editor, *The Foundry*, receives congratulations of Vincent Delport, Penton Publishing Co. London representative.

Other tests undertaken by the speakers have shown that it is necessary to have the oven tight, to cut down as much as possible on the amount of cool air introduced in the recirculation circuit, and to choose a thermal cycle permitting a slow rise in temperature.

Final session paper, "*Flowability of Foundry Sands*," by L. M. Diran, A. J. Shaler and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, reported that results of grid analyses show that molding sand flow under pressure is the result of two different mechanisms. In the initial deformation, the speaker said, flow is due almost entirely to shearing of clay-water films that coat sand grains. The second and subsequent flow is due to fragmentation of sand grains.

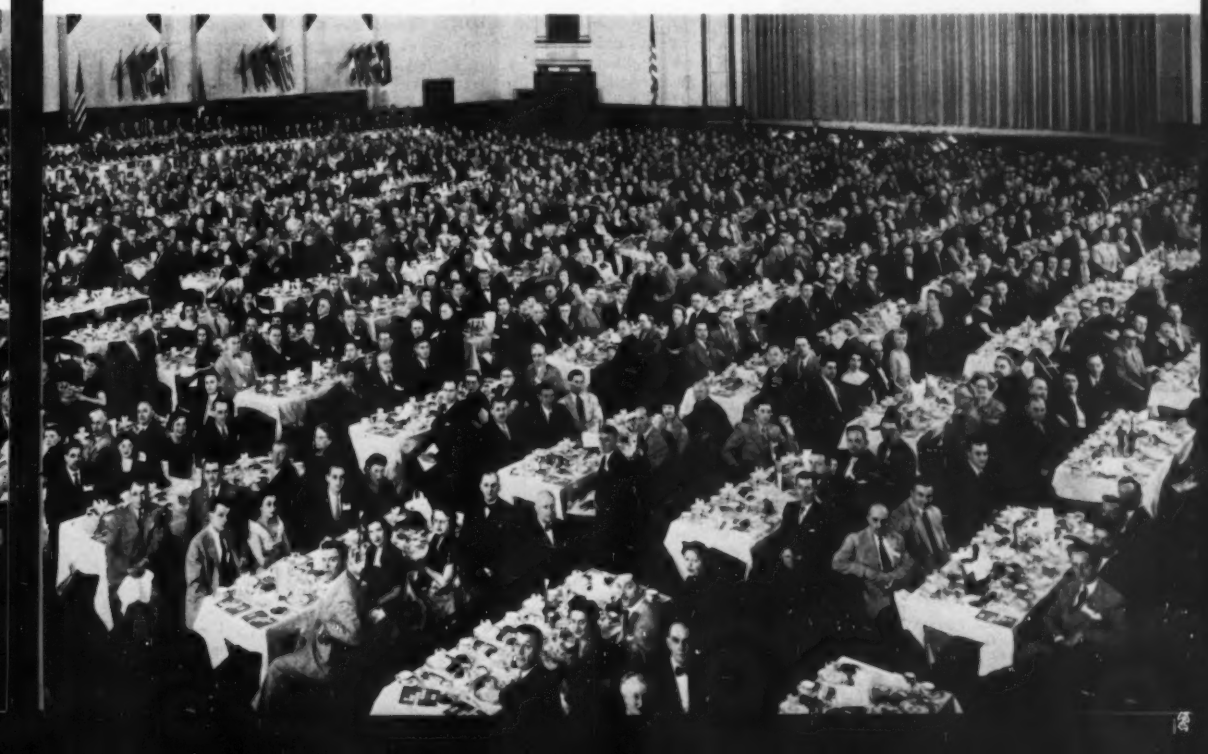
Flow, the speaker said, depends upon the type of bond used, shape of sand grains, and method of loading. Sodium-bentonite bonded sands undergo greater deformation than kaolin-bonded sands, and molding sands containing angular grains flow more than round-grained sands.

In conclusion, the speaker said that compressibility and shear angle tests based on results of grid analyses bear out the theory that molding sands of good flowability possess poor compressibility.

Climaxing Saturday's program was the year's top foundry social function—the International Banquet.

International banquet

The International Banquet, described as a "foundry family dinner," by A.F.S. President Seelbach, who presided, was attended by 1175 foundrymen and their ladies. During his address commending those who contributed to the success of the Congress, Mr. Seelbach called attention to the empty chair at his



A.F.S. Secretary Emeritus R. E. Kennedy (left) pinning old timers buttons on, left to right: E. R. Miller of Staten Island, N. Y., 40 years in the foundry industry; R. W. Miller, Tulsa, Okla., 33 years; H. A. Schwartz of Cleveland, 50 years; and English Old Timer Tom Makemson, secretary of the Institute of British Foundrymen, Manchester, England, 48 years in the industry.

Noel Newman of England offers thanks of overseas foundrymen at Banquet.

right and requested the audience to stand in silence for a moment in memory of the late Dr. Guido Vanzetti, Fonderie Milanese di Accario Vanzetti, Milan, Italy, president of the International Congress of Foundry Technical Associations during its formative years.

A.F.S. Past National President Ralph J. Teetor, chairman of the A.F.S. Board of Awards, presided over presentation of A.F.S. Gold Medal Awards and Honorary Life Memberships to eight foundrymen whose contributions to the art of metal casting and to the Society have been outstanding:

Henton Morrogh, British Cast Iron Research Association, Alvechurch, Birmingham, England—the Wm. H. McFadden Gold Medal "for outstanding work and development in the field of spheroidal cast iron."

Albert Portevin, Institut de France, Paris—the Joseph S. Seaman Gold Medal "for technical contributions over many years to the arts and sciences of the foundry industry." The award was accepted at the Banquet by Dr. Marcel Ballay, France, who received the honor for Mr. Portevin, who was ill and unable to attend.

Frank G. Steinebach, editor, *Foundry*, Cleveland—the John A. Penton Gold Medal "for outstanding contributions to the foundry industry and the Society."

A. P. Gagnebin and Keith D. Millis, International Nickel Co., New York —joint award of the Peter L. Simpson Gold Medal "for outstanding work and development in the field of spheroidal cast iron."

Three American foundrymen were presented with Honorary Life Memberships in the American Foundrymen's Society in recognition of their contributions to the foundry industry and the Society:

William G. Mixer, consultant, Flint, Mich.—"for a lifetime of service and application of engineering to the foundry industry."

A. I. Krynitsky, National Bureau of Standards, Washington, D. C.—"for a lifetime of fundamental research in metal casting."

A.F.S. National President Walter L. Seelbach of Cleveland "in recognition of his services to A.F.S. as its President, 1951-52."

International Vice-President L. N. Shannon presented the International Award of Honor — a bronze replica of Cellini's *Perseus* provided by Mario Olivo of Milan, Italy, to Dr. Eugenio Mortara in the name of the late Carlo Vanzetti of Milan, past president of the International Committee and one of its original organizers. Dr. Vanzetti's son, Guido, who was to have accepted the award for his late father, died in March. Dr. Mortara in turn presented the award to Mr. Seelbach, entrusting its care to A.F.S. as custodian for the Vanzetti family.

Noel P. Newman of England, past president of the Institute of British Foundrymen, spoke to the gathering on behalf of the International Committee, delivering its official thanks for the 1952 International Foundry Congress.

An innovation in Annual Banquet entertainment—a complete professional stage show in place of the

L. N. Shannon of Birmingham, Ala., vice-president of the International Committee, and Mrs. Harry W. Dietert of Detroit welcome ladies at the A.F.S. Tea.

traditional Banquet speaker—was an unqualified success.

Accompanied by Joseph Stern's orchestra and introduced by Master of Ceremonies Rush Hughes, the show opened with a ballet depicting Mardi Gras in New Orleans. Next, lending an international flavor to the show, was the celebrated European "Magical, Musical Novelty" act, the Marvellos.

Following this was the dance team of Landre and Verna, a ballet—"The Indian Maids", songs by the Nine Mellodians, pianologues by Leo De Lyon, and a ballet appropriate to the occasion—"Flags of the Nations." Climaxing the Banquet, the entire audience and cast joined in singing the nostalgic "Auld Lange Syne," while the 65 foundrymen at the head table, representing more than a dozen countries, joined hands to symbolize the brotherhood of free foundrymen which recognizes no political or geographic boundaries.

Foundry Show free day

On Sunday, May 4, designated "International Day," the Foundry Show opened its doors free-of-charge to foundrymen of the Chesapeake, Metropolitan and Philadelphia Chapter areas to give them an opportunity to see the newest developments in tools for the metal castings trade.

In keeping with its title, "International Day" was largely devoted to meetings of committees and subcommittees of the International Association of Foundry Technical Associations and to the International Reception in the afternoon.

Also meeting during the day were the A.F.S. Board of Directors and executive committees of the eight A.F.S. technical divisions.

Only one technical session was held on Sunday—the Gray Iron session at 2:00 p.m. Under the chairmanship of J. S. Vanick, International Nickel Co., New York, the session featured presentation of three papers from overseas.

The first two of these papers dealt with the practical applications of nodular iron to industry.

Carlo Longaretti and Mario Noris of the Institut for Siderurgi Finsider, Genoa, Italy, presented the Official Exchange Paper from the Italian Metallurgical Association, in which they described *"A New Process for the Industrial Production of Nodular Iron with Low Treatment Costs."*

Second paper was presented by Corrado Galletto, Centro Informazione del Nickel, Milan, Italy, and dealt with *"Production of Heavy Spheroidal Graphite Cast Iron Gears."*

Concluding paper, Official Exchange Paper from the Association Technique de Fonderie de France, *"Gases and Naturally Occurring Blowholes in Foundry Practice,"* was presented by title only because of the inability of its author, Albert Portevin of Institut de France, Paris, to attend.

The remainder of the day was given over to social events. The first of these was the Ladies' Musicale, held in the Lounge of the Ambassador Hotel with Mrs. Frank G. Steinebach of Cleveland presiding, assisted by Mrs. A. A. Diebold of Buffalo and Mrs. Arthur J. Tuscany of Cleveland.

International reception

All overseas Congress visitors and their ladies were invited to the International Reception in the Renaissance Room of the Ambassador Hotel at 5:00 p.m., when A.F.S. President Seelbach, President-Elect I. R. Wagner, Vice-President Elect Collins L. Carter and officials of the organizations comprising the National Castings Council welcomed delegates from some 35 nations to the Congress.

Over 200 Canadian foundrymen attended the Annual Canadian Dinner, Sunday, May 4, in the Belvedere Room of the Hotel Traymore. National Director J. J. McFadyen, Galt Malleable Iron Co., Galt, Ont., presided over the dinner, which featured fellowship, stories and short informal talks.

Speakers included V. E. Zang, Unitcast Corp., Toledo, Ohio; Joseph E. Sully of Toronto; and E. N. Delahunt of Warden-King, Ltd., Montreal, all past National Directors of A.F.S. Foundrymen from seven Canadian provinces, England, Australia and the United States were present at the dinner.

EDITOR'S NOTE: Complete news coverage of International Foundry Congress sessions and events of May 5 through 7 will appear in the June issue.

Several hundred members of the three A.F.S. Canadian chapters held an enjoyable get-together at the Canadian Dinner, May 4, an event that has become an annual tradition because of its spirit of fun and hearty good-fellowship.

Foundry organization convention activities

Examining plaque presented to the Foundry Equipment Manufacturers' Association by its Italian counterpart are, left to right: Luigi Lodigiani, Arthur J. Tuscany, Mario Olivio, and C. V. Nass.

←

Noel P. Newman (left), past president of the Institute of British Foundrymen, presents Honorary Life Memberships in IBF to Dr. J. T. MacKenzie (center) and Oliver Smalley during Business Meeting of American Foundrymen's Society.

Annual Non-Ferrous Founders' Society dinner held the first night of the International Foundry Congress.

Top staff of participating organizations joined National Castings Council at breakfast prior to NCC annual meeting.

Left to right are P. E. Rentschler, John M. Price, and M. J. Allen discussing future plans for FEF at the Foundation's annual meeting.

Charles A. Barnett presents report at Foundry Educational Foundation's meeting. Left, Claude B. Schneible.

←

Robert B. Hill, Prof. Charles Walton, and Donald H. Workman (left to right) examine coated casting in Gray Iron Founders' Society booth. Other organizations with booths and displays at the 1952 International Foundry Congress were the National Foundry Association, the Foundry Equipment Manufacturers' Association, Foundry Facing Manufacturers' Association, and Non-Ferrous Founders' Society.

Society elects new officers and directors

Officers

President

I. R. Wagner
Electric Steel Castings Co.
Indianapolis

Vice-President

Collins L. Carter
Albion Malleable Iron Co.
Albion, Mich.

Directors

To serve for three years

Martin A. Fladoes
Sivyer Steel Casting Co.
Milwaukee

Walter J. Klayer
Aluminum Industries, Inc.
Cincinnati

J. O. Klein
Texas Foundries, Inc.
Lufkin, Texas

To serve for three years

A. D. Matheson
French & Hecht Division, Kelsey-Hayes Wheel Co.
Davenport, Iowa

H. G. Robertson
American Steel Foundries
Alliance, Ohio

To serve for one year

Walter L. Seelbach
Superior Foundry, Inc.
Cleveland

■ Heading the roster of new officers and directors of A.F.S. elected at the Society's Annual Business Meeting during the 1952 International Foundry Congress is President-Elect **I. R. Wagner,** Electric Steel Castings Co., Indianapolis. Vice-President-Elect of A.F.S. for 1952-53 is **Collins L. Carter,** Albion Malleable Iron Co., Albion, Mich.

W. J. Klayer

W. L. Seelbach

Directors elected to serve three-year terms are: **Martin A. Fladoes,** Sivyer Steel Casting Co., Milwaukee; **H. G. Robertson,** American Steel Foundries, Alliance, Ohio; **J. O. Klein,** Texas Foundries, Inc., Lufkin, Texas; **A. D. Matheson,** French & Hecht Division, Kelsey-Hayes Wheel Co., Davenport, Iowa; and **Walter J. Klayer,** Aluminum Industries, Inc., Cincinnati.

Walter L. Seelbach, Superior Foundry, Inc., Cleveland, will serve for one year as a director upon completion of his term as A.F.S. President following the annual meeting of the Board of Directors this summer.

Biographies

I. R. Wagner, President-Elect, has had a distinguished record of service to the Society and to the foundry industry. Mr. Wagner began his foundry career in 1912 as a member of Alan Wood Iron & Steel Co.'s maintenance crew. Following several years as a metallurgical chemist with eastern foundries and with the Ordnance Department, he joined Electric Steel Castings Co., Indianapolis, as a metallurgical chemist. Mr. Wagner was named general manager and vice-president of that firm in 1934, and president in 1942. Retired from the presidency of Electric Steel Castings Co. in 1950, he has remained a member of its Board of Directors. Mr. Wagner has served as chairman and director of the A.F.S. Central Indiana Chapter, National Director of A.F.S., A.F.S. National Vice-President (1951-52), and is past vice-president and president of the National Foundry Association.

Collins L. Carter, Vice-President-Elect, has spent his entire foundry career with Albion Malleable Iron Co., Albion, Mich., since receiving his degree in metallurgical engineering from Cornell University in 1929. Beginning as a supervisory trainee at Albion in 1929, Mr. Carter became a salesman in 1933, sales manager in 1936, and in 1938 was named president and general manager of the firm. Mr. Carter served as a major of infantry from 1941 to 1944. Active in the formation of the A.F.S. Central Michigan Chapter, Mr. Carter has also been prominent in other foundry organizations, serving as president of the Malleable Founders' Society and the National Castings Council and as a director of the Malleable Founders' Society.

Director-Elect Martin A. Fladoes is president of Sivyer Steel Casting Co., Milwaukee, an organization he first joined following two years service as an infantry master sergeant in World War I, and graduation from the University of Wisconsin in 1920. He has been a national director of the Steel Founders' Society of America (1938-39) and a member of the Steel Casting Advisory Board in World War II.

Director-Elect J. O. Klein graduated as a pharmacist from Northwestern University in 1904 and did not enter the foundry industry until 1914, when he became a production clerk with Vermillion Malleable Iron Co., Hoopeston, Ill. He has since been superintendent of several prominent midwestern foundries prior to assuming his present position as vice-president and secretary of Texas Foundries, Inc. Mr. Klein has long been active in A.F.S. affairs and has served as a director of the Texas Chapter.

Director-Elect Walter J. Klayer is works manager of the Foundry Division of Aluminum Industries, Inc., Cincinnati, where he has been employed since 1926. Mr. Klayer is a past vice-chairman (1948-49) and chairman (1949-50) of the A.F.S. Cincinnati District Chapter, and simultaneously (1948-49) was chairman of the Cincinnati Chapter of the American Society for Metals. He has also been active in work of the A.F.S. Aluminum & Magnesium Division and has written extensively for the technical press.

Director-Elect A. D. Matheson, born and educated in Canada, began his foundry career in 1913 in the offices of French & Hecht Co., Davenport, Iowa, then spent six years in the plant learning the trade. He has been, consecutively, assistant plant superintendent, plant superintendent, plant manager and general manager of the firm, now the French & Hecht Division of Kelsey-Hayes Wheel Co. Mr. Matheson was instrumental in the formation of the A.F.S. Quad City Chapter.

Director-Elect H. G. Robertson, since getting his B.S. in Mechanical Engineering from Purdue University in 1926, has spent his entire foundry career with American Steel Foundries. Beginning at that firm's Granite City, Ill., plant as an apprentice in 1926, he left there to become works manager at ASF's McKee's Rocks, Pa., plant, and in 1938 transferred to the Alliance, Ohio, works where he is works manager. He is past chairman of the A.F.S Canton District Chapter.

Walter L. Seelbach, upon completion of his term as A.F.S. President this summer, will become a member of the Board of Directors for one year. During Mr. Seelbach's term of office, he has acted as a goodwill ambassador from A.F.S. to foundrymen of many lands, a contributing factor to the success of the 1952 International Foundry Congress. The long-range, industry-sponsored A.F.S. Safety & Hygiene & Air Pollution Program was also inaugurated under Mr. Seelbach's guidance.

Announce Winners of 29th A. F. S. Apprentice Contest

■ Near-record total of 268 entries marked the 1952 Apprentice Contest, the 29th in the history of the American Foundrymen's Society. Top-ranking apprentices, 11 from the United States and four from Canada, were victors in the five contest divisions—Gray Iron Molding, Steel Molding, Non-Ferrous Molding, Wood Patternmaking and Metal Patternmaking — at the National Judging, held April 1 at the University of Illinois, Navy Pier Branch, Chicago.

Ten A.F.S. chapters held local contests in preparation for the National Judging: Birmingham District, Detroit, Eastern Canada, Metropolitan, Michiana, Northeastern Ohio, Northern Illinois-Southern Wisconsin, Southern California, St. Louis and Wisconsin. In addition, 10 in-plant contests were held by foundries and pattern shops located throughout the United States.

First prize winners in their respective contest divisions are: *Gray Iron Molding,* Robert P. Schmidt, Browne & Sharpe Mfg. Co., Providence, R. I.; *Steel Molding,* Henry C. Grube, Waukesha Foundry Co., Waukesha, Wis.; *Non-Ferrous Molding,* Fernand Lemieux, Dominion Engineering Works, Ltd., Montreal, Que., Canada; *Wood Patternmaking,* David L. Schroeder, Universal Foundry Co., Oshkosh, Wis.; and *Metal Patternmaking,* Luther R. Hardin, Ford Motor Co., Detroit.

Robert P. Schmidt
1st, Gray Iron Molding

Henry C. Grube
1st, Steel Molding

These five divisional contest winners were guests of the American Foundrymen's Society at the 1952 A.F.S. International Foundry Congress & Show in Atlantic City, May 1 through 7, where they each received $100 prizes and certificates from A.F.S. National President Walter L. Seelbach during the Society's Annual Business Meeting on Saturday, May 3.

Second prize winners in each of the five contest divisions, who received $50 at plant or A.F.S. chapter ceremonies are:

Gray Iron Molding, Jerome J. Rodman, Whitin Machine Works, Whitinsville, Mass.; *Steel Molding,* Adolph C. Zinn, Waukesha Foundry Co., Waukesha, Wis.; *Non-Ferrous Molding,* Jack Monaco, Dominion Engineering Works, Ltd., Montreal, Que., Canada; *Wood Patternmaking,* Fred R. Fiorentini, Modern Pattern Works, Cleveland; and *Metal Patternmaking,* Donald E. Wagley, City Pattern & Foundry Co., South Bend, Ind.

Winners of $25 third prizes are: *Gray Iron Molding,* Ronald J. Kurber, International Harvester Co., Chicago; *Steel Molding,* Rolland LaLumiere, Canadian Car & Foundry Co., Ltd., Montreal, Que., Canada; *Non-Ferrous Molding,* Gaston Vigneault, Miller's Brass Foundry, Three Rivers, Que., Canada; *Wood Patternmaking,* Donald A. Siebert, Royal Pattern Works, Cleveland; and *Metal Patternmaking,* Burdette

SECOND PRIZES

Jerome J. Rodman
Gray Iron Molding

Adolph C. Zinn
Steel Molding

Jack Monaco
Non-Ferrous Molding

Fred R. Fiorentini
Wood Patternmaking

Donald E. Wagley
Metal Patternmaking

C. Hendricks, Pontiac Motor Division, General Motors Corp., Pontiac, Mich.

Members of the A.F.S. Apprentice Contest Committee, responsible for arrangements and overall coordination of the Contest, are:

Chairman Roy W. Schroeder, University of Illinois, Navy Pier Branch, Chicago; Vice-Chairman George E. Garvey, City Pattern & Foundry Co., South Bend, Ind.; F. W. Burgdorfer, Breejen, Nichol Straight Foundry Co., Chicago; Robert Hendry, Love Bros., Inc., Aurora, Ill.; J. Artz, Artz Foundry Co., Chicago; and C. G. Mate of the Greenlee Foundry Company, Chicago.

Steel Molding: Albert P. DiGirolamo, Chicago Steel Foundry Co., Chicago; Sam Belus, Burnside Steel Foundry Co., Chicago; and W. B. Goltra, Goltra Foundries, Inc., Barrington, Ill.

chairmen in making the 1952 Apprentice Contest a success.

The Apprentice Contest Committee is indebted to the following firms for their assistance in expediting the 1952 Contest:

City Pattern Foundry & Machine Co., Detroit, for making castings used by the Metal Pattern Division.

Caterpillar Tractor Co., Peoria, Ill., for making the master pattern used by the molding divisions.

Fernand Lemieux
1st, Non-Ferrous Molding

David L. Schroeder
1st, Wood Patternmaking

Luther R. Hardin
1st, Metal Patternmaking

Missouri Pattern Works, St. Louis; A. C. Gocher, Fletcher Works, Inc., Philadelphia; James Holtzapple, Continental Foundry & Machine Co., East Chicago, Ind.; Edward J. McAfee, Puget Sound Naval Shipyard, Bremerton, Wash.; Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit; R. L. Selburg, Caterpillar Tractor Co., Peoria, Ill.; G. Ewing Tait, Dominion Engineering Works, Ltd., Montreal, Que., Canada; J. J. Thompson, Fletcher Works, Inc., Philadelphia; and Jos. E. Foster, Technical Assistant, A.F.S., Chicago.

Judges for the 29th A.F.S. Apprentice Contest, judged at the University of Illinois, Navy Pier Branch, Chicago, on April 1, were:

Gray Iron Molding: Adrian C. Den

Non-Ferrous Molding: William C. Wick, Wells Manufacturing Co., Skokie, Ill.; Joseph A. Mulvey, Crane Co., Chicago; and Fred L. Riddell, H. Kramer & Co., Chicago.

Wood Patternmaking: H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind.; Robert Carlson, Hagstrom & Carlson, Chicago; Al Cervenka, Sr., A.B.C. Pattern & Foundry Co., Chicago.

Metal Patternmaking: Harry C. Swanson, Arrow Pattern & Foundry Co., Chicago; and H. J. Jacobson, Industrial Pattern Works, Chicago.

American Foundrymen's Society and the A.F.S. Apprentice Committee wish to acknowledge with thanks the work of chapter apprentice contest chairmen and in-plant contest

Scientific Cast Products Co., Chicago, for making 20 duplicate aluminum patterns from the master patterns for the molding divisions.

City Pattern & Foundry Co., South Bend, Ind., for finishing the 20 molding contest duplicate patterns.

International Harvester Co., McCormick Works, Chicago, for making shipping boxes for contest patterns.

Edward J. McAfee, master patternmaker, Puget Sound Naval Shipyard, Bremerton, Wash., for making the drawing pattern for the contest's Wood Patternmaking Division.

International Harvester Co., Research Division, Chicago, for x-raying contest castings.

Crane Co., Chicago, for x-raying contest castings.

THIRD PRIZES

Ronald J. Kurber
Gray Iron Molding

Rolland LaLumiere
Steel Molding

Gaston Vigneault
Non-Ferrous Molding

Donald A. Siebert
Wood Patternmaking

Burdette C. Henricks
Metal Patternmaking

Three foundry organizations hold annual elections

M. J. Allen

H. A. Forsberg

■ Annual meetings and election of officers were held during the International Foundry Congress by the National Castings Council, the Foundry Educational Foundation, and the Non-Ferrous Founders' Association.

In addition to holding elections, the National Castings Council passed a resolution commending A.F.S. President Water L. Seelbach, Superior Foundry, Inc., Cleveland, Vice-President I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., and Secretary-Treasurer Wm. W. Maloney, Chicago, on the success of the 1952 International Foundry Congress. NCC also heard a progress report on the Safety & Hygiene & Air Pollution Program.

National Castings Council

Named president of the National Castings Council was H. A. Forsberg, Continental Foundry & Machine Co., East Chicago, Ind., president of the Steel Founders' Society of America. He succeeded former NCC President C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, president of the Foundry Equipment Manufacturers' Association.

A. V. Martens, Pekin Foundry & Manufacturing Co., Pekin, Ill., president of the National Foundry Association, was re-elected vice-president of NCC. Also re-elected were: secretary, Frank G. Steinebach, editor, *Foundry*, Cleveland and treasurer, F. Ray Fleig, Smith Facing & Supply Co., Cleveland, representing the Foundry Facing Manufacturers' Association.

The National Castings Council is made up of the president and one other representative of each of nine foundry organizations—American Foundrymen's Society, Foundry Educational Foundation, Foundry Equipment Manufacturers' Association, Foundry Facing Manufacturers' Association, Gray Iron Founders' Society, Malleable Founders' Society, National Foundry Association, Non-Ferrous Founders' Society, and Steel Founders' Society of America.

Educational Foundation

The Foundry Educational Foundation has held its annual meeting regularly at the A. F. S. Convention each year starting with the first annual FEF meeting in 1946. Foundry Educational Foundation officers for 1952-53, elected on recommendation of the organization's Nominating Committee, are: chairman of the board, John M. Price, Ferro Machine & Foundry Co., Cleveland; president, M. J. Allen, American Steel Foundries, Chicago; vice-president, J. T. Mac Kenzie, American Cast Iron Pipe Co., Birmingham, Ala.; and secretary-treasurer, Charles A. Barnett, Foundry Equipment Co., Cleveland.

Mr. Price, retiring president of FEF, succeeds Claude B. Schneible, Claude B. Schneible Co., Detroit, board chairman during 1951-52, who now becomes a trustee-at-large. Mr. Allen was vice-president of the Foundation last year. Mr. Barnett succeeds himself.

In addition to 12 trustees-at-large and the officers, FEF is governed by two representatives appointed by each of the six founding member societies—American Foundrymen's Society, Foundry Equipment Manufacturers' Association, Gray Iron Founders' Society, Malleable Founders' Society, Non-Ferrous Founders' Society, and Steel Founders' Society.

Non-Ferrous Founders

Annual election of officers for the Non-Ferrous Founders' Society, which along with the NFFS "Let's Get Acquainted" dinner has come to be an annual non-ferrous feature of A. F. S. conventions, resulted in the naming of the following to head NFFS during 1952-53: president, L. H. Durdin, Dixie Bronze Co., Inc., Birmingham, Ala.; 1st vice-president, Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Inc., Indianapolis, Ind.; 2nd vice-president, Arthur Fischer, Fischer Casting Co., Plainfield, N. J.; and continuing as secretary-treasurer, James W. Wolfe, Chicago.

J. D. Zaiser, Ampco Metal, Inc., Milwaukee, immediate past president, continues on the board of directors. Mr. Langsenkamp, 2nd vice-president last year, succeeds Mr. Durdin as 1st vice-president.

J. H. Price

L. H. Durdin

A. V. Martens

For heavy jobbing castings and cores

Cement-bonded molding sand

C. D. GALLOWAY III / *Fdry. Supt., Chambersburg Engr. Co., Chambersburg, Pa.*

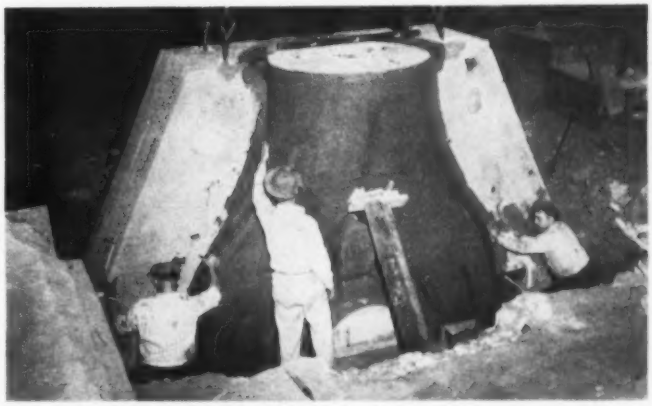
The advantages of cement-bonded sand make it a particularly valuable material for producing molds and cores for heavy jobbing castings, while its limitations prevent its economical use for light and medium production work. This article reviews some of the studies and experiences one foundry had in making the change from dry sand to cement.

■ Although many foundries have found cement-bonded sand useful for certain jobs, few specialize in large castings to such an extent that it is their principal molding material. Chambersburg Engineering Co. builds impact forging machinery. Their large iron foundry produces the heavy castings for these massive machines, and also does a jobbing casting business in the 5,000 to 100,000 pound weight range. The work is infinitely variable in size and type. They pour gray iron and alloy irons, including ductile iron. Both floor and pit molding are employed.

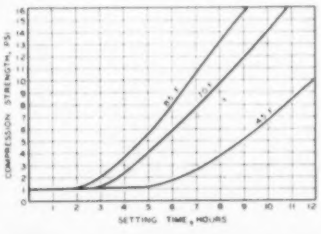
Their foundry engineers were quick to recognize the potential value that cement molding offered for their specialty—heavy jobbing castings. It was tried on a limited scale shortly after introduction in this country, and as soon as some of the unknowns were solved its use was rapidly expanded in the plant until now, with few exceptions, all molds and cores are made with cement-bonded sand.

With experience, the advantages and limitations became more clearly defined. Certain practices peculiar to successful handling were worked out from engineering studies and comparison of the properties of dry sand and cement.

To the producer and consumer of high quality castings in the heavy jobbing field, cement molding offers several proven advantages. Castings can be produced to closer tolerances and with less shrinkage troubles due to greater mold accuracy and strength, with better surface finishes, and with less physical labor in ramming, shake-out, and cleaning. The process permits a wider flexibility of pit molding because the strength of the cement allows the use of unlined pits. Rigging costs as well as capital equipment investment are reduced since flasks require no bars or arbors, cores have no arbors or lifting plates, and drying ovens and blast cleaning equipment are eliminated. The 48 to 96-hour drying time seldom interferes with production schedules on large castings because of the inherently long manufacturing cycle involved.



Core setting operation on 50,000-lb centrifugal blower casting. Accuracy of components is essential for easy assembly. Notice level atop core.



Curves show compression strengths and setting times for cement-bonded sands at various temperatures.

To a large extent, sand mixtures and their characteristics govern molding and core-making practices and the quality of the finished product. Cement-bonded sands have properties which differ greatly from any other molding or core material in general use, and special practices must be adopted to handle them satisfactorily. A new crop of problems is introduced with this material, and careful control of mixing, handling, and drying must be maintained for good results.

The mixtures found most satisfactory at Chambersburg are shown in Table 1. These are not the only

satisfactory ones; wide variation to suit particular conditions is possible. Preparation is best accomplished in a muller type mixer.

The reclaimed sand, Table 1, is used molding material which has been crushed in a hammer mill, screened, and then cascaded in front of an exhaust outlet to remove most of the fines. In this way about 75 per cent of the used sand is reclaimed for use.

The changing strength and drying characteristics of the cement-bonded sands constitute the basis for the main problem encountered in the use of the material. Since cement sand has no green binder it has almost no green strength. When first mixed it is little stronger than damp silica sand. Its strength increases progressively by the hydration of the cement, not by drying or heating. The setting or hardening rate is a function of temperature as shown by the green compression curves. As hydration progresses the sand quickly loses its workability. In cold weather—60 F or lower—the setting is slow and finishing can be done without difficulty up to five hours after mixing, but at higher temperatures the time diminishes to about two and one-half hours. This property of the material presents some operating problems but also has some advantages.

Because green strength is low, the sand will not stand up over loose pieces when they are drawn, necessitating the frequent use of ram-up cores or other means of providing support. If the cement is allowed to set before removing wood patterns or loose pieces, they will be held in a vise by the sand and cannot be drawn. Molding and core-making operations must be adjusted to suit the weather, or other provisions must be made to release the pattern if it is not drawn before the cement has set.

In many cases hardening of a mold or core before handling is an advantage since its full strength may be attained before being moved. This permits great reduction in the use of gaggers, nails, rods, and arbors to supply auxiliary strength. The sand itself provides the principal support of the mold or core. The large body core for the turbine case casting shown in Fig. 1 is an example of a core made without arbors. This core, weighing 14 tons, was made in the mold which was lined with sand to give the desired metal section. It was rammed with a minimum of rods and only six lifting hooks. Absence of arbors made ramming and cleaning much easier. After the cement had set, the core was lifted out, blackened, and allowed to air dry before replacing.

A high degree of mold accuracy is obtained because cement eliminates dimensional changes resulting from handling molds and cores while green and due to heat of drying or baking. It also is highly resistant to distortion under metal pressure during pouring and solidification. This contributes to the unusual degree of precision in large casting work.

Degree of precision is rather difficult to define because it is so interrelated with pattern construction, casting design, and foundry practice. However, experience at Chambersburg shows that in most cases finishes can be reduced to 75 per cent of those required for dry sand practice, casting surfaces will be true to pattern without the usual swells or distortion, and properly made cores or molds will seldom vary more than 1/16 in. from pattern size. Warping of long castings on cooling is held to a minimum and is uniform.

This high strength also eliminates many shrinkage problems. It is the author's belief that a large proportion of the shrinkage troubles in most foundries are due to mold expansion. A mold which swells under pressure of the liquid metal will require excessive feed metal from the risers, and shrinkage defects result. With properly made cement molds this problem is not present.

In the early days, much emphasis was placed on making castings in cores without patterns or flasks. This can be done successfully (as is demonstrated in Fig. 2 which shows a cylinder liner mold made entirely of cores) but is suitable only for small, light sectioned work and certain castings (such as the hydraulic turbine parts shown in Fig. 3) where shape is repetitious. For most castings this system does not eliminate any of the pattern but simply cuts it up and requires additional core boxes and extra core setting, after which the mold must be rammed in a flask or pit to hold it and prevent runouts when poured. Even when this ramming is not necessary, the additional reinforcing of open block molds slows the ramming of the blocks, and the reinforcing must be carefully designed. The structure is

FACING SAND	
Washed silica sand, A. F. S. fineness 41	750 lb
Reclaimed sand	750 lb
Cement, high early strength	184 lb
Water by weight	7.6-8.2%
BACKING SAND	
Reclaimed sand	1500 lb
Cement, high early strength	92 lb
Water by weight	5.0-5.5%

Table 1 . . . Two typical cement-bonded sand mixtures.

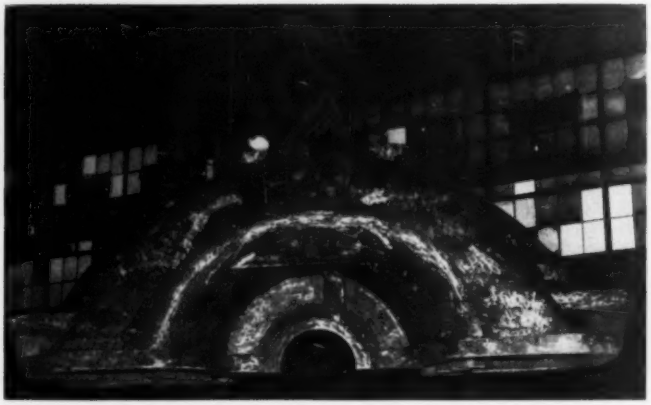


Fig. 1 . . . This turbine exhaust casting weighs 50,000 lb. Although the core weighed 14 tons, it was made with no arbors and only six lifting hooks.

not subject to inspection after ramming. With flasks the reinforcing is visible and safer, and the fewer fins make cleaning less costly.

Since the curing and drying of cement is a natural process dependent on temperature, humidity and air circulation, it must be controlled to a limited extent, and care must be exercised that all surfaces are sufficiently dry before the mold is poured. Weather conditions make drying rates variable, and deep pockets having little air circulation will not dry satisfactorily without special circulation or heat.

Since shop conditions vary widely, some non-destructive means of testing for excessive moisture had to be developed to insure against the use of damp components. To do this an electric hygrometer was adapted to record changes in humidity within the small sensing head which is held against the surface of the part (Fig. 4). If the surface is dry, no humidity change will be recorded.

It is important to note that cement molds and cores are never completely dry. Water of crystallization is retained in the cement and only released at high temperature. Evaporation only removes the free moisture from approximately the first inch below the surface. Below this point the moisture content remains about 3 per cent. When this is turned to steam by the heat of the metal, it expands to 1600 times its liquid volume, creating great quantities of gas which must be vented without excessive back pressure to prevent blows. Where casting design makes large vents impossible, oil sand is used. Under certain conditions not fully understood, a parting or area of weakness will occur about $\frac{1}{8}$ in. below the surface of the sand. No satisfactory method of inspection for this defect has been found. When metal is poured the eighth-inch surface layer buckles or spalls. To prevent this, cores and molds are covered during the first twenty-four hours after ramming to retard moisture loss. This practice is necessary only in spring and fall when rapid changes in temperature and humidity occur.

Molds and cores must be given a good coat of blackening to produce usable castings. Unblackened sand adheres to the casting to such an extent that it cannot be satisfactorily removed. A well-coated surface will peel away and leave a fine casting finish without any need for the usual blasting or grinding.

Sea coal is used extensively as a sand additive for facing in heavy sectioned work. Approximately 3 per cent by weight is added to the regular facing mixture. It is believed that the action of the sea coal is different than in green sand practice. Cement, being a strong oxidizer, tends to consume the blackening coating when subjected to high temperature for long periods, and penetration results. Since coal is a reducing agent it neutralizes the cement and thus protects the blackening from the dangers of being consumed.

Collapsibility is low, and danger of casting cracks is great if the material is not properly handled. In most cases cores can be produced satisfactorily by limiting the thickness of the cement facing and filling the centers with cinders or other suitable material. In large box sections having less than $\frac{3}{4}$ in. wall thickness the cores frequently cannot be made weak enough, and we must use other materials.

One note of caution to patternmakers is important. Do not use shellac on patterns or core boxes because the cement softens it and makes it stick to the sand. Any good grade of cellulose-base pattern lacquer or hard rubber paint will work well in its place.

Finally, shake-out and cleaning are accomplished with pneumatic hammers. This is a surprisingly easy operation, as the reduction of arbors, rods, and flask bars possible with cement permits easy release from the flask and accessibility for core knockout.

Fig. 2 . . . Cylinder liner mold was made without the use of flasks.

Fig. 3 . . . Shows hydraulic turbine top plate and curb ring castings.

Fig. 4 . . . Electric hygrometer testing the dryness of mold surface.

Summary

The decision to adopt cement molding on a large scale is one which merits careful consideration in the light of the advantages offered by present-day practices. The analysis should not be limited to foundry operations but should take into account the over-all cost including machining and finishing operations. There are many cases where foundries have used the process with success in special situations where available flasks, drying ovens, etc., could not accommodate the molds or cores being made. It is a valuable tool which can be put to work in the average foundry with a relatively modest investment in capital equipment.

Study dust and fume exposure control at

Foundry health conference

■ Practical steps toward improved health protection of foundry workers were outlined April 11 and 12 in a conference at the University of Michigan School of Public Health. Planned under the direction of a committee headed by William G. Fredrick, Detroit Department of Health, and H. E. Miller, School of Public Health, the conference had a number of leading industrial hygienists, foundrymen, and doctors on its special faculty. Sponsors, in addition to the School of Public Health were the university's Institute of Industrial Health and its Department of Production Engineering, the Michigan Department of Health, the Detroit City Department of Health, and the American Foundrymen's Society.

Conference speakers and participants considered overall health measures the first day, then broke up into a ferrous and a non-ferrous group for the second day. All lectures and discussions were carefully integrated for continuity and information was aimed at the smaller foundries less likely to be able to utilize the more expensive means of solution of health problems.

Environment control

Originally limited to 60 the conference registration swelled to 103 with participants coming from Michigan, Illinois, Wisconsin, Indiana, Ohio, Pennsylvania, New York, New Jersey, Missouri, Tennessee, Kentucky, and Canada.

In his introductory remarks opening the conference, Henry F. Vaughan, dean of the School of Public Health, pointed out that everyone is a victim of his environment and that the purpose of the conference was to outline methods for controlling environment. Mr. Fredrick presided throughout the morning.

People working in a plant are a company's greatest single investment, said A. C. Hensel, Albion Malleable Iron Co., Albion, Mich., keynote speaker. An annual payroll is about one-half of the average company's net worth, he declared, in urging greater health protection in foundries. Citing the increasing trend toward control by regulatory groups, he stressed the importance of development by the foundry industry of information for the guidance of those who prepare regulations and ordinances.

Representatives of participating agencies and principal speakers at University of Michigan foundry health conference, left to right were: Dr. Otto Tod Mallory, Jr., Institute of Industrial Health; A. C. Hensel, Albion Malleable Iron Co.; J. A. Radcliffe, Ford Motor Co.; H. E. Miller, School of Public Health; R. A. Flinn, Production Engineering Dept.; W. G. Ferrell, Auto Specialties Mfg. Co.; Wm. G. Fredrick, Detroit Health Dept.; and K. E. Robinson, Michigan Health Dept.

Dr. Oscar A. Sander, industrial medical consultant of Milwaukee —introduced as the man who has done most to separate fact from fiction in the field of dust-caused diseases in the foundry—described a 20-year study of silicosis in Milwaukee foundries. Most cases today, he said are found in old-timers who worked under conditions prevailing prior to today's awareness of the problem. Iron dust, found to a considerably greater extent in ferrous foundries than is free silica, can give radiological evidence similar to silica, he explained.

It is not sufficiently well known, stated Dr. Sander, that most foundry workers who contract silicosis are not disabled. There is an increasing number of foundries, he declared, in which exposure of 15 years or more produces no evidence of silicosis and no progression in existing cases.

Ralph G. Smith, Detroit Health Dept. (right), collects metal fume sample in breathing zone of Wm. A. Spindler, U. of Michigan, for chemical analysis.

In the absence of Donald Van Farowe, Michigan Department of Health, his paper on measurement of dust in foundries was presented by Don Fowler of the department. He described the techniques of collecting and studying samples of airborne (10 microns and under) dust. Particle size is important, he said, because of the influence of surface area on chemical reactions in the body. He urged the use of dust counts in studying the efficiency of ventilating equipment and in developing foundry health data.

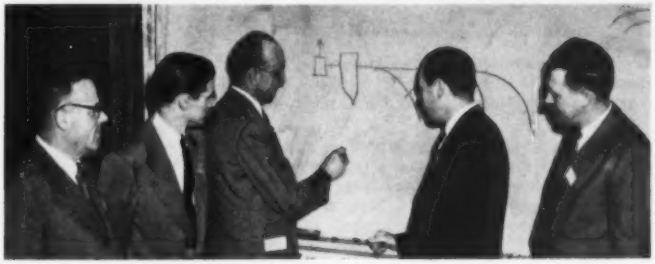
At the second general session, held the afternoon of the first day, Paul W. Olson, Eaton Mfg. Co., Vassar, Mich., presided. First speaker was H. J. Weber, American Brake Shoe Co., Chicago, whose subject was "*Housekeeping.*" Dust control starts with good housekeeping, declared Mr. Weber, adding that the smallest plant can afford good housekeeping though its advantages are often overlooked or ignored. The most dangerous dust, he said, stays longest in the air. Good ventilation alone is not enough, he stated, urging the use of vacuum cleaning equipment as an aid in eliminating dust.

Use of wetting agents

Edward Meiter, Employers Mutual Insurance Co., Milwaukee, outlined methods of dust control by isolation, substitution, and wetting agents. The number of employees exposed to dust can be minimized, he asserted, by isolating dust-producing operations by space or time. Less toxic materials can be substituted for the offending dust, he said, in an effective control measure which attacks the problem at its source. As examples, he mentioned use of metal shot and grit for blasting, and low silica or non-siliceous parting materials.

Water containing wetting agents is made more effective in wetting and pentrating many foundry dusts, said Mr. Meiter. He described proportioning equipment available, stating that "wet" water can be used to prevent dispersion of accumulated dusts, to stop it at its origin, and to collect it after it has become dispersed.

Dr. Oscar A. Sander, industrial medical consultant, Milwaukee, speaking on the nature of disease caused by dust, urged foundrymen to hire early-stage silicotics to eliminate call for compensation when there is no real disability.



Above right, Dr. Carey P. McCord, Institute of Industrial Health (left), discussing rare health hazards with Harold R. Hoyle, Dow Chemical Co. At blackboard, H. J. Weber, American Brake Shoe, sketches foundry exhaust system for health conference speakers. Left to right: Edward Meiter, Employers Mutual Insurance Co.; Ralph G. Smith, Detroit Health Dept.; Mr. Weber; Dr. Otto Tod Mallory, Jr.; Institute of Industrial Health; and Paul O. Olson, Eaton Manufacturing Co.

Ralph G. Smith of the Detroit Department of Health presented a paper on respirators prepared by Alphonse J. Kaimala. Respirators used in the foundry industry are the air-purifying or the supplied-air type, he said. The air-purifying respirators filter particulate matter and are applicable to many foundry operations, he declared. Failure of workers to wear this type of respirator is often due to poor maintenance and cleanliness, he warned, in outlining a program for keeping respirators usable.

Supplied-air respirators, said Mr. Smith, protect the worker from harmful or toxic atmospheres by supplying him with respirable air from a source independent of the immediate working environment. While respirators of both types are useful in the foundry, he concluded, they are not a substitute for local or general exhaust ventilation, use of wet methods, enclosing and isolation of processes, or any combination of these.

A program of indoor and outdoor ventilation will not be successful unless it is under some one responsible person, said William N. Witheridge, General Motors Corp., Detroit, in his talk on foundry ventilation. He described and illustrated ventilation of an entire space to achieve dilution, process enclosure to isolate and exhaust dust and fume, and local exhaust systems which remove air contaminants at the source.

Stage demonstrations

In the evening, foundrymen witnessed movies and demonstrations of foundry health and safety measures in the University of Michigan teaching foundry, under O. W. Boston and R. A. Flinn, Production Engineering Dept. Movies on respirator selection, use, and maintenance, and on general industrial health measures were arranged by Dr. Otto Tod Mallory, Jr., Institute of Industrial Health, and Gerald A. Conger, Production Engineering Dept. Kenneth Packer, Production Engineering Dept., and George Hama, Detroit Department of Health, demonstrated use of x-ray equipment and measurement of radiation. Don Fowler illustrated dust sampling and counting procedures. Fume control, sampling, and analysis were shown by W. A. Spindler, Production Engineering Dept., and Ralph G. Smith.

Separating into two groups the second day, foundrymen met with

Reviewing a point in the non-ferrous paper of George Hama, Detroit Dept. of Health, are, left to right: Wm. G. Fredrick, Detroit Dept. of Health; Mr. Hama; Frank A. Patty, General Motors Corp.; and George R. Slick, Beckett Bronze Co.

H. E. Miller, School of Public Health (left), and E. C. Hoenicke, Eaton Mfg. Co., study a health conference paper.

R. A. Flinn presiding at the ferrous meeting, and Frank A. Patty, General Motors Corp., Detroit, presiding at the non-ferrous sessions. Non-ferrous speakers and their topics were: Dr. L. E. Hamlin, American Brake Shoe Co., Chicago, *"Nature, Manifestations, and Management of Lead Poisoning and Metal Fume Fever;"* Wm. G. Fredrick, *"Measurement of Lead and Zinc Exposures;"* George Hama, *"Control of Metal Melting and Pouring Operations;"* Bernard D. Bloomfield, Michigan Department of Health; *"Control of Dust Exposures;"* and Dr. Carey P. McCord, Institute of Industrial Health Consultant, *"An Overall View of Exposures."*

Metal fume fever (zinc shakes) is rarely encountered, said Dr. Hamlin, and is not in the same category with lead intoxication in magnitude of hazard and effect on health. Metal fume fever is brief and has no after effects, hence if marked symptoms remain after 24 or 36 hours, lead intoxication should be suspected, he declared.

It is important to differentiate between lead absorption and lead intoxication, Dr. Hamlin pointed out. Before a final diagnosis of lead intoxication is made, he said, the doctor should have complete data on the lead content of a worker's blood and urine, and his working environment, and on his physical condition. He described his company's program of periodic urinary lead determinations and told how the small foundry can take advantage of available agencies and competent industrial doctors in carrying on a similar program.

Metal contents of blood and urine are more accurate indications of lead exposure than breathing zone measurements of air, Mr Fredrick said in his talk. Nevertheless, he said, every foundry melting lead alloys should arrange for a periodic air analysis of work areas. Good information on source concentrations is essential since, he warned, visual examination of fuming is a poor indication of the contribution an operation makes to the overall metal content of the air.

He described the control of lead exposure by means of urinary lead determinations. A lead content above 0.15 mg per liter, calculated as an average of all workers in an area, indicates excessive exposure, he declared, and means that sooner or later cases of lead poisoning will appear. Foundries were urged by Mr. Fredrick to use the official public health facilities available to them in studying their industrial health problems. You might as well take advantage of the fact that you've already paid for them through taxes, he pointed out.

Mechanical control aids

Vapor pressure of copper, tin, and aluminum is low, Mr. Hama advised, and they therefore do not contribute to the fume problem as do lead and zinc. To combat lead and zinc fume, he said, enclosures, hoods, and local ventilation must be used because ordinary dilution and general ventilation require prohibitively costly air volumes. He suggested approaching a local exhaust problem by imaging the operation completely enclosed, then visualizing the openings necessary to conduct the operation, using doors which can be closed whenever possible to minimize the air volume required to be moved. Ladle heating stations can also contribute to the lead hazard, he warned, and should not be overlooked in studying ventilation of non-ferrous foundries.

At the afternoon non-ferrous session, Mr. Bloomfield stated that reasonable care in molding areas where sand is handled moist will keep the silica dust concentration well below the maximum allowable concentration. Core knockout, he declared, can be a serious source of dust since the sand is dry and the castings are generally hot, creating drafts that carry dust into the air. Cover and exhaust sand mixing equipment, he advised, and put respirators on men operating sand cutters or who are conditioning sand on the floor by hand.

Cleaning operations should be exhausted locally for greatest effectiveness, he said. He advised against recirculating air because, he declared, the highly efficient dust removal required is not usually possible at reasonable cost.

Dr. McCord drew on his long experience in industrial medicine to review types of exposures which rarely arise but which are possible. He recommended consulting the industrial hygiene agencies whenever starting to use some unusual foundry material or whenever some unusual symptoms occur among workers. Cadmium poisoning rarely occurs in industry in the United States, he said. Magnesium in the form of its recently produced oxide is a cause of metal fume fever.

Fluorine and fluorides, used commonly in magnesium foundry practice, are highly toxic, Dr. McCord declared, but more often than not cause only dermatitis. He mentioned the garlic breath which develops on exposure to tellurium fumes. Silicon—not silica—is harmless, he

continued on page 145

Appoint new director for Society's

Ten-Year S & H & AP program

■ New impetus has been given the A.F.S. Safety & Hygiene & Air Pollution Program by the appointment of William N. Davis of Chicago as its director. Mr. Davis comes to A.F.S. from the National Safety Council, Chicago, where he has been a senior engineer since 1948, serving as a consultant to the foundry and other metals industries on industrial safety practices.

Mr. Davis, who took over full-time staff administration of the A.F.S. Safety & Hygiene & Air Pollution Program as of May 1, succeeds the program's first director, Kenneth M. Morse, who resigned in March to become a member of the industrial hygiene staff of United States Steel Corporation, Pittsburgh.

Mr. Davis brings 14 years' experience as an industrial safety engineer to his new position. A graduate of Massachusetts Nautical School, with post graduate work at Wayne University, he has served with several nationally-known insurance companies as a safety engineer, and during the last four years with the National Safety Council has been responsible for setting up, administering and advising safety programs for the metals industry. He is a member of the American Society of Safety Engineers and the American Society of Mechanical Engineers.

In his new position as director of Safety & Hygiene & Air Pollution for the Society, Mr. Davis takes over a long-range program that has been well under way for several months. Instituted last year at the request of many foundries throughout the United States, the program is being carried out by the American Foundrymen's Society over a 10-year period with the cooperation of all member organizations of the National Castings Council.

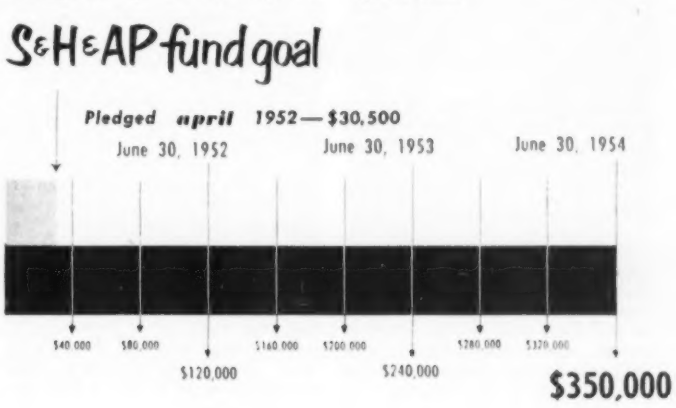
Overall objective of the A.F.S. Safety & Hygiene & Air Pollution program is to aid foundries in developing their own standards of working conditions. This objective is being fulfilled in a number of ways: assembly and dissemination of authoritative data, compilation of a reference library, revision of existing codes of recommended practices, undertaking of limited research, and sponsorship of seminars and conferences. An example of this is the Foundry Health Conference, held April 11 and 12 at the University of Michigan. A full report of this Conference will be found on pp. 70.

William N. Davis

To fulfill this long-range program, a minimum fund of $350,000 is being raised entirely by voluntary subscriptions from foundries. Contributions are solicited on the basis of casting tonnage per foundry. To date, only four months after solicitation of funds began, foundries have contributed upwards of $30,000. Contributors this month are:

S & H & AP Contributors April 1 to 31, 1952

Alloy Steel Products Co., Bloomfield, N. J.
Archer-Daniels-Midland Co., Foundry Products Div., Cleveland.
Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago.
Calumet Steel Castings Corporation, Hammond, Ind.
Cincinnati Milling Machine Co., Cincinnati.
Commercial Steel Castings Co., Marion, Ohio.
Continental Foundry & Machine Co., East Chicago, Ind.
Cooper Alloy Foundry Company, Hillside, N. J.
F. E. Myers & Bro. Co., Ashland, Ohio.
Oberdorfer Foundries, Inc., Syracuse.
Olds Alloys Co., South Gate, Calif.
Pacific Steel Casting Co., Berkeley, Calif.
Pettibone Mulliken Corp., Chicago.
Treadwell Engineering Co., Easton, Pa.
Westlectric Castings, Inc., Los Angeles, Calif.



Brass foundry mechanization

■ Moccasin Bushing Co., Chattanooga, Tenn., illustrates progressive mechanization of a small bronze foundry at low cost with improvements paying for themselves during the mechanization program. The company produces five to six tons of finished castings daily, working an 8-hr day, six days a week. Operated as an integral part of the company is a machine shop. Moccasin produces all types of bushings and bearings, as well as bar and cylinder stock from as-cast to fully-machined condition for machine tools, heavy machinery, and ordnance. Some 15 analyses of bronze are produced regularly, another 20 less frequently.

Ahead of schedule

A substantial proportion of Moccasin (name comes from a moccasin-shaped area of land enclosed by a bend in the Tennessee River) Bushing's production is a line of oil-distributing bearings containing specially treated white pine dowels which act as wicks to bring oil from oil reservoirs to bearing surfaces.

The existing foundry — over 40 years old — was studied and engineered by Moccasin management to provide for fullest possible mechanization at minimum cost and least possible disruption of a heavy production schedule. The progressive program is about 80 per cent complete with more than 20 per cent of the scheduled 3-year period available for completion, according to Carter N. Paden, Sr., president and general manager of Moccasin Bushing Co.

Started with molding floors

First step was to eliminate traditional storage of molds on the floor by providing roll conveyors for the squeezer molders. The conveyors have a horizontal section for mold storage and pouring, then double back in a hairpin turn to bring the poured molds to the shakeout area by gravity. After shakeout, molds and bottom boards return to the molder on a short length of inclined roll conveyor to complete the circuit. Molding sand is conditioned through a portable screener and aerator which throws it onto a heap located between two molders.

Fig. 1 . . . All pouring at Moccasin Bushing Co. is done with covered ladles suspended from monorails. Flasks move around hairpin turn in conveyor to cooling area in background.

Improve cleaning room

The second step in mechanizing was to replace tumbling barrels running under water with a skip-loaded, airless-shot blast tumbling unit with a dust collecting system. Step three was the installation of a monorail system serving pouring, charge makeup, cleaning areas, and melting room. The monorail system serves all traffic lanes for material movement. Castings are poured by means of 300-lb covered ladles. Charges are made up in funnel-ended tote boxes moved via monorail and chain hoist between the metal storage area and the furnace room. Tote boxes of castings from the shakeout areas travel over the

Fig. 2 . . . Metal temperatures are measured with immersion pyrometer before ladle leaves melting department.

Fig. 3 (top) . . . Scale car between rows of bins eases charge make-up.

Fig. 4 (above) . . . Furnaces tilt to discharge or receive metal.

same monorail serving the charge makeup area and the same scale is used to weigh charges and cast metal from the shakeout. The latter is the first step in a metal control program which accounts for all metal in the shop.

Most recent change, step four in the mechanization program, is the addition of roll conveyors to supplement handling of tote boxes by monorail at the cutoff wheel. After weighing, tote boxes of castings from shakeout are placed on a short length of roll conveyor at waist height which ends at the cutoff wheel operator's left. As castings and gates are separated, the castings are tossed to the right into the skip of the shot blast machine. Gates go into tote boxes at the right on a length of roll conveyor which takes them away from the cutoff wheel and back under the monorail.

Metal analyses are kept segregated by the use of tote boxes which are returned to metal storage in marked bins after weighing.

Mechanical shakeout next

Final step in the mechanization of Moccasin will be the installation of mechanical shakeouts and overhead storage of sand for the machine molders.

In addition to the squeezer molders, served by roll conveyors, there are four squeezer floors and two floor molding floors. The latter six are served by a crane bridging the length of the floors with the ladle traveling parallel to mold rows for convenience in pouring and pickup of castings after shakeout.

The molders use a natural Indiana molding sand conditioned mechanically and kept in heaps on the floors. Sand strength and volume are maintained by addition of new sand required as determined by experience.

Extrude cores

Most of the cores are made by extrusion from three machines. Special cores are made by hand on benches. Tennessee and Georgia core sands are mixed with synthetic resin binders in a portable muller, the bottom half serving also as a wheelbarrow, the upper half containing the mixing mechanism and mo or suspended on a chain hoist from a jib crane.

The binder now used, according to Foundry Superintendent Chester Miller, gives a minimum amount of gas, a little better collapsibility (not a significant factor in production at Moccasin), and considerably faster baking than binders formerly used. Cores are baked in a gas-fired oven with automatic controls and recirculated air.

The melting department is located in a separate room well ventilated by natural draft and adjoining both molding areas. Hoods and ducts with additional fans are to be installed shortly. The four diesel oil-fired rotary furnaces each turn out 600 pounds of bronze in about 40 minutes, exclusive of the first heat started with a relatively cold lining. Two furnaces are located at each side of one end of the melting department with the charging end toward the wall, the pouring end toward the center aisle. A monorail

Fig. 5 . . . Two of the four furnaces in the melting department. Entire room is now well ventilated by fans and is remarkably free of zinc oxide fume. Additional fans and a hood and duct system will be installed shortly.

Fig. 6 . . . Ladle not in use is kept hot with oil burner. Dolly brings ladle out under monorail track when needed.

runs completely around the furnace area for convenience in charging. A single rail down the middle of the room with a switch and short rail at each furnace enables the pouring crew to fill ladles.

If a ladle is not needed for a short time, it is lowered onto a dolly and pushed under an oil burner where it is kept hot. Temperature of each ladle is checked with an indicating-recording immersion pyrometer as the ladle passes the pyrometer station near the door to the molding department. Metal is deoxidized and slag is skimmed at the temperature control station.

Fig. 7 . . . Pouring and cooling end of molding loop. Molds are made at right background, poured at right, cooled at left, dumped at left background.

Fig. 8 (far left) . . . Portable sand conditioner is moved wherever required to screen, temper, aerate, and pile sand in heaps or rows.

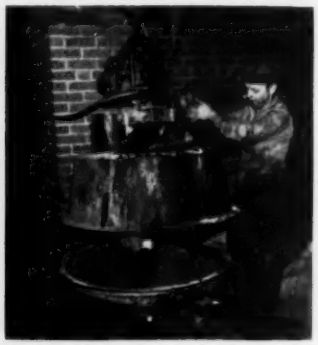


Fig. 9 (left) . . . Core sand mixer hangs from jib crane near sand storage. Wheelbarrow type mixing pan is easily moved a few feet to core room.

Fig. 10 (facing page) . . . Stock cores made by extrusion machines are extensively used in making Moccasin bushings and bearings.

Charges are made up in an area near the cleaning room for convenience in segregating and storing gates, returns, and borings and turnings from the machine shop. Ingot, and the various types of returns (including spills carefully scraped from the molds prior to shakeout) are stored by analysis and type of melting stock in a double row of bins. These face a track carrying a platform scale. Charges are made up by weight directly in charging boxes with a snout at one end which fits into the charging end of the furnaces.

After the castings have been cleaned, they are turned over to three grinders working at double-end stand grinders. Finished castings are sorted as ground onto an apron back of the grinding equipment for inspection and shipping or transport to the adjacent machine shop. All grinders are exhausted into the cyclone serving the other cleaning equipment. Twice a year the metal dust from the grinders and cutoff wheel is shipped to smelters for recovery of metal.

Metal control includes weighing of charges, castings and gates after shakeout, gates after removal from castings, finished castings, scrap, borings and turnings from the machine shop, and castings shipped. Strict accounting for metal at all stages of production enables Moccasin to keep waste at a minimum, keep a minimum of metal in stock, and comply as readily as possible with government metal controls.

Crew makeup

The 30 men on the foundry crew are divided into eight molders, two melters, five coremakers, five cleaning room workers, one charge makeup man, one man in charge of pattern storage, two pourers, and six who condition sand, shift weights, shakeout, and perform general labor work. All use goggles, masks, safety shoes, and gloves as may be required by their work. They favor rubber

Fig. 11 . . . Finely divided metal from grinders and cutoff wheel is salvaged and returned to smelter.

impregnated cotton gloves because, they say, they like their long-wearing and abrasion resistant qualities.

Moccasin has not confined modernization to the foundry alone. A new, modern brick and glass block office has replaced the old office facilities. The combination of general office, private offices, and file storage makes for convenience in carrying on company business internally and with customers. Offices connect directly with the machine shop and foundry. A fire alarm system and burglar alarm network protect office equipment and records.

In addition to building a new office during the past year, Moccasin has also constructed a new fireproof pattern storage room. Patterns are carefully catalogued and stored in shelves for convenience and rapid handling.

Fig. 13 . . . Orderly pattern storage protects patterns, speeds production.

Fig. 12 . . . Castings from shakeout come to cutoff wheel on conveyor at left. Gates and risers go into tote boxes on conveyor at right while castings go into loading skip of airless blasting machine at far right.

▶ *Choose national nominating committee candidates soon*

■ Chapters not represented on the Nominating Committee during the past two years are eligible to suggest candidates for the 1952-53 committee. Eligible chapters should forward names of two members,* for possible appointment to the Nominating Committee, to the National President not later than July 1 as prescribed by Art. X Sec. 1 of the By-Laws: "*The Board of Directors of each Chapter eligible to have a member on the Nominating Committee shall annually select two candidates for the Nominating Committee from the Chapter membership, preferably representing different branches or divisions of the industry with the membership. The names of the candidates shall be forwarded to the President on or before July 1 of each year.*"

Chairmen of eligible chapters who have not done so are urged to call board meetings soon to select Nominating Committee candidates. Names should be sent to Walter L. Seelbach, President, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

▶ *British foundrymen to hold 49th annual conference*

■ The Institute of British Foundrymen will hold its 49th annual conference at Buxton, Derbyshire, June 10 through 13, with the Sheffield and District Branch of the Institute as host. Hotel reservations are to be made directly with the hotels; advance registration should be sent to the Institute of British Foundrymen, St. John St. Chambers, Deansgate, Manchester 3. All technical sessions will be held at the Spa Hotel, Buxton, which will serve as conference headquarters. A ladies' program and visits to plants have been arranged.

▶ *Issue booklet describing apprenticeship programs*

■ What apprenticeship is, occupations in which apprentice training is given, how apprenticeship programs are established, functions of the Bureau of Apprenticeship, state apprenticeship agencies, and joint management-labor apprenticeship committees are explained in the 1952 edition of *The National Apprenticeship Program*. Copies can be obtained free from Publications Branch, Bureau of Apprenticeship, U. S. Department of Labor, Washington, D. C.

Pricing castings by the pound is a dangerous fallacy!

Without becoming involved in accounting procedures and phraseology, this paper critically examines a few of the systems used in determining the cost and selling price of castings. It was first presented by the author at the Northwest Regional Conference of A.F.S., Oct. 6, 1951, Vancouver, B.C., Canada.

N. H. TERRY / *Vice-pres., Canadian Sumner Iron Works, Vancouver, B. C., Can.*

■ One of the tragedies of the foundry industry is endeavoring to cost and sell castings by the pound. Every class of casting differs in design and construction; one casting weighing 10 lb might require twice or ten times as much labor as another casting weighing 100 lb, ten times the weight. Yet many foundries today are still selling from price lists where the sale price of the casting per pound is automatically reduced as the individual weight of the casting increases.

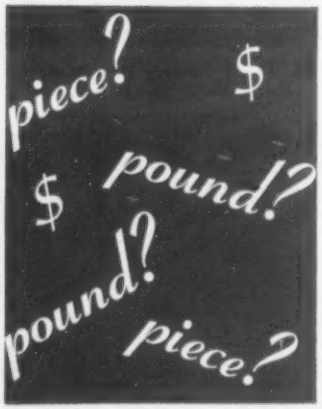
It may be true that for some jobs where a large volume of castings of the same style and shape are being made, an average cost per pound might be acceptable. However, in many foundries job orders are more common, and orders for individual castings from one pattern are frequent. To secure accurate costs, individual castings should be costed separately instead of using the inaccurate method of averaging the cost of castings by the variation in individual weights.

To check on individual operations, an accurate cost-estimating, cost-finding and cost-keeping system is essential. Principles are outlined in the following paragraphs quoted from the "Manual of Job Cost Finding Practice for Miscellaneous Jobbery Steel Foundries," prepared by the Steel Founders' Society of America.

"The principles of the cost system must not be too complicated; that is, they should be capable of being easily applied in every steel foundry regardless of the size of the plant or volume of business done.

"The principles of the cost system, while not complex, must be logical and practical.

"The results obtained from a job cost system should show reasonable



differences between the costs of simple and difficult castings. Some cost systems tend to produce costs which are not logically representative so far as showing the actual difference in costs of making different kinds of castings, that is, they tend to produce average costs of production.

"The cost system should correctly reflect the close parallel which actually exists between the costs of producing the same castings in open hearth furnace foundries and in electric furnace foundries.

"Cost data representing actual performance of a large number of foundries should be used in the development of the cost system.

"Different methods of applying indirect and overhead expenses to individual castings should be studied, compared, and tested in order that the most satisfactory methods may be selected.

"General principles of applying indirect and overhead expenses to individual castings should be recommended, subject to further refinements by those in a position to make them, such as separate, rather than average, overhead rates for different kinds of molding and coremaking and for the different operations in the cleaning department.

"Clear definitions of the limits of each department should be determined and the definitions of what constitutes direct labor and materials should be adopted."

Job cost system

A brief description of the general principles of a *job cost system* is also contained in the manual.

1. Cost of steel per net ton of good castings varies with yield.

2. Molding department overhead expense is a percentage of molding direct labor cost.

3. Core department overhead expense is a percentage of core direct labor cost.

4. Cleaning department overhead expense is a percentage of cleaning direct labor cost.

5. Annealing or normalizing cost, pattern storage expense, casting inspection cost, and shipping expense are added together and charged to a specific casting at a fixed amount per ton of good castings.

6. Works burden expense is a percentage of the sum of all the above expenses and the total direct labor costs.

7. Administrative and selling expense is a percentage of total works cost which comprises all expenses in the plant.

While every company, if only for taxation purposes, keeps a monthly record and prepares an annual financial statement which summarizes the over-all foundry operations, our objective should be to maintain a cost-recording system which can show, if necessary, an accurate cost of each individual casting, so that every casting will be sold at a profit. Otherwise, groups of castings will be sold at a loss while others will be

compelled to carry a heavy margin of profit in order to arrive at an average monthly income.

In most foundries of a certain type in a given area, wage rates paid are approximately the same, equipment used is similar, and cost of raw materials should be identical. Thus, direct costs of making castings should vary little. Due to ingenuity of individual foundry operators, care in essential details, and intelligent supervision of direct costs, variations will be evident. It is, therefore, in the method of applying overhead or indirect costs to the cost of the castings produced that wide variations occur in the cost and selling price of individual castings.

Without attempting to explain any specific cost system, let us examine some cost essentials.

Melting. The first element of cost is to ascertain the true cost of the metal. This is generally accepted as the molten metal cost at the spout. All the elements of melting cost should be compiled on simple report forms which will provide space to show all metal used. All metal should be accurately weighed. In a cupola, the coke should be weighed and recorded. In an electric steel furnace the electricity used should be reported, while for brass melting the fuel used should be recorded. All labor used in preparing the metal, maintaining the furnace, all furnace maintenance material, etc. (including a proportion of the depreciation on the equipment) should be added together to determine a true, accurate cost of the material melted during each heat and during any given period.

Coremaking. In any job order system in foundry operations, every effort should be made to charge the cost of coremaking to each individual job. The time for making the cores should be charged to the job on suitable time sheets. The core department cost should be charged with all core materials used, core oven fuel, depreciation on core department equipment, and all these indirect core expenses should be charged to the job on the basis of core hours worked, or in proportion to coremakers' wages.

Molding. For individual floor molding, keeping molding costs on each job should be comparatively simple. Where molding machines are used extensively the problem becomes complex but not beyond solution. Naturally machine molding requires proportionately more mechanical equipment and often more indirect labor, and utilizes more floor space. In straight manual molding, the charging of the actual wages to the individual job should be adequate. In machine molding, a formula for each machine, or the whole department, must be worked out. Usually match plates are used to handle a large volume of castings in each flask, which, together with special molding flasks, sand control, and mechanical conveniences, will multiply the tonnage of castings produced compared to the molding wages expended. After a time study and check on the production of a machine molding unit or department, it is usually more practical to work out the cost of the castings produced as a group by consolidating all the elements of molding and coremaking wages, indirect materials, indirect labor, and overhead, into the cost for the day, week, or given period. Dividing this figure by the tonnage or number of good castings produced gives the cost of each casting or the net cost per pound. In any event, for either floor and bench hand molding or machine molding, a report of each employee's time should be filed each day giving details of jobs worked and the details of the castings molded.

Pouring and cleaning. While pouring and cleaning are usually considered indirect expense and charged to the total cost of castings through general overhead distribution, it should be considered good business to allocate these costs to specific jobs where pouring necessitates special pouring equipment and unusual mechanical devices. Where complicated castings require an unusual amount of cleaning due to special core work, such time should be recorded against the specific castings so that they

TABLE 1

	Overall Total	Average Per Lb	Average Per Casting
Cost of Metal	$11,000	$ .055	$2.75
Molding & Coremaking Direct Labor	4,000	.020	1.00
DIRECT COST	$15,000	$ .075	$3.75
Other Core Costs	1,000	.005	.25
Other Molding Costs	3,000	.015	.75
Fixed Charges	4,000	.020	1.00
Indirect Expense	8,000	.040	2.00
OVERHEAD COST	$16,000	$ .080	$4.00
TOTAL COST	$31,000	$ .155	$7.75

TABLE 2

	Overall Total	Average Per Lb	Average Per Casting
Cost of Metal	$ 8,800	$ .055	$1.10
Molding & Coremaking Direct Labor	4,000	.025	.50
DIRECT COST	$12,800	$ .080	$1.60
Other Core Costs	1,200	.0075	.15
Other Molding Costs	4,000	.025	.50
Fixed Charges	4,000	.025	.50
Indirect Expense	8,000	.050	1.00
OVERHEAD COST	$17,200	$ .1075	$2.15
TOTAL COST	$30,000	$ .1875	$3.75

Combined Tables 1 and 2 show that a foundry can work to full capacity and still show cost variations from month to month.

cover their fair share of this extra time. If this added cost is charged against the general run of regular castings, it will result in increasing the over-all cost of castings and give inaccurate costs.

Indirect expenses or overhead. This factor in the cost of producing castings probably accounts for the high cost of castings today. During the last few years all industries have been called upon to absorb an ever-increasing amount of government taxes, group insurance plans, vacation and holiday pay, unemployment insurance, compensation assessments, etc., in addition to regular fixed charges which have also advanced. Thus, unless these expenses are carefully recorded and fairly distributed, inaccurate costs result, and incorrect sales prices follow.

Overhead includes the fixed charges of operating the foundry. These include depreciation reserves on buildings, machinery, and equipment; fire insurance on the entire foundry; municipal property taxes and rent of property used for the business; trucks and cartage costs; electric power and light; heating costs exclusive of power and gas for melting; repairs to buildings and fixtures; assessments for compensation and similar indirect charges not applicable against individual jobs, departments, or operations; service wages and salaries such as storekeepers, shippers, time keepers, watchmen; and similar items.

While the foregoing is intended to include all indirect expenses applicable to manufacturing, some organizations may wish to add their pattern department as part of their foundry costs. Depending on the nature of the business and whether their pattern maintenance can be classified as an integral part of their castings production, their pattern manufacturing, repairing, storing, etc., might be correctly added to their basic castings costs, either as a specific charge for each casting or at an average price per pound of castings made or on a percentage basis of the over-all monthly cost.

Wherever possible, pattern department costs should be recorded separately, and may be added later on a basis best determined by the type of business. Only in this way can a true cost of producing castings be established. Comparison can be made later in cases where the customer supplies his own pattern, and no pattern costs would be involved.

Total general administration costs should be recorded separately from foundry manufacturing overhead costs. These include selling expenses, travelling, advertising, office expenses, and special administration expenses necessary to the successful operation of every business.

It should be stressed that any information compiled by the cost accountant is based on information supplied by foundry personnel, so it is most essential that all information furnished by the foundry be accurate, complete, and prompt.

	TABLE 3		TABLE 4	
	Figured By Weight	Figured By Casting	Figured By Weight	Figured By Casting
Cost of Metal 50 lb @ 5-1/2¢/lb	$ 2.75	$ 2.75	$ 2.75	$ 2.75
Molding & Coremaking 3 hr @ $2/hr	6.00	6.00	6.00	6.00
Other Core Costs	.25	.25	.375	.15
Other Molding Costs	.75	.75	1.25	.50
Fixed Charges	1.00	1.00	1.25	.50
Indirect Expense	2.00	2.00	2.50	1.00
COST PER CASTING	$12.75	$12.75	$14.125	$10.90

Combined Tables 3 and 4 show variations in other castings based on same months.

Detailed cost examples

While we have to some extent generalized on the essential factors to be considered in arriving at accurate foundry or casting costs, let us now be more specific and by comparison show where variations in arriving at the cost of producing similar castings may easily occur where some of the fundamentals are overlooked. Comparisons will be drawn for a foundry dealing in iron castings, analyzing methods of arriving at castings per piece and per pound.

The figures used in these examples are purely arbitrary, chosen for illustrative purposes only. They are in no way "real," and as such should not under any circumstances be used as a basis for price determination or cost analysis.

In a particular month (Table 1) this hypothetical foundry produces 100 tons of castings. The average weight of castings is 50 lb, and 4,000 good castings are made. Molten iron cost is 5½¢ per pound. Indirect labor is calculated to include pouring shaking out, cleaning, and similar items. Ninety man-hours are needed per ton of good castings, a total of 9,000 man-hours.

This same foundry might also work to capacity the second month, with the quite different results shown in Table 2. Here only 80 tons of castings are produced. Average weight of castings is 20 lb, and 8,000 good castings are turned out. As before, molten iron cost is 5½¢ per pound. Total man-hours are unchanged at 9,000, with 112½ man-hours required per ton of castings.

Comparing the operations of these two months shows quite clearly that average costs can be dangerous. The figures show that total castings made during the first month (Table 1) cost an average of more than twice those made during the second month (Table 2). It is likely that some identical castings were made in each monthly period; these castings should cost the same, regardless of what month they were produced. Therefore we can only assume that other very complicated and expensive castings were also made in the first month, and that their high cost has been added to the cost of the more simple castings. This accounts for the increase in average costs.

Alternately, if the costs of the first month are accurate, we can assume that during the second month some simple and inexpensive castings were made, reducing average costs.

Repetition work on one hand against single castings from one pattern on the other would make obvious cost variations, never disclosed in average monthly analyses.

Remember too that if selling prices are set on average costs, the

TABLE 5

	FIRST MONTH		SECOND MONTH		
	Figured By Weight	Figured By Casting	Figured By Weight	Figured By Casting	Figured Per Cent
Cost of Metal 100 lb @ 5-1/2¢/lb	$ 5.50	$ 5.50	$ 5.50	$ 5.50	$ 5.50
Molding & Coremaking 1-1/2 hr @ $2/hr	3.00	3.00	3.00	3.00	3.00
Overhead Cost	8.00	4.00	10.75	2.15	12.00
COST PER CASTING	$16.50	$12.50	$19.25	$10.65	$20.50
COST PER POUND	16.50¢	12.50¢	19.25¢	10.65¢	20.50¢

Table 5 shows results for one casting, all obtained by standard methods and all different. Here, each casting weighed 100 lb. Overhead costs were obtained from figures derived in earlier examples for various months' operations, with exception of the Per Cent figure; this was based on 400 per cent of direct labor cost as explained in the text.

continual adjustments will eventually lead to lack of confidence by the customers. Complicated castings are sold below cost, and the simple castings must be overpriced to balance the loss.

Applying indirect expenses

Calculations of individual casting costs on the basis of each of these two months' operations show how different methods of allocating indirect expense may change cost and sales figures. Suppose this foundry now makes 50-lb castings, each requiring one hour's coremaking and two hours' molding. On the basis of the first month's operation, cost per casting as figured per pound and per casting turns out equal as shown in Table 3.

However, on the basis of the second month's operation, cost per casting as figured per pound and per casting turns out quite different (Table 4).

Notice that the figures for the second month not only disagree with each other but also disagree with the figures for the first month, another indication of the danger of averages.

There is still a third basis for calculating overhead distribution—percentage of direct labor. During the first month, direct labor costs were $4,000 while indirect costs were $16,000, or 400 per cent of direct labor costs. For the second month, direct labor cost $4,000 while indirect costs were $17,200, or 430 per cent. It may be possible, by comparing several months' operation and allowing for variations in average casting weights and total production, to arrive at a figure of 400 per cent as a fair basis of calculations. In this case, the cost for the 50-lb casting would work out as follows:

Metal Cost	$ 2.75
Molding & Coremaking	6.00
Overhead, 400%	24.00
COST PER CASTING	$32.75

This figure agrees with none of those previously obtained for this casting

It is obvious that calculating costs in the foundry where fluctuations in casting shape, size, volume, and specifications occur is a very exacting job. It calls for constant study and compiling of statistics over a long period of time. Carefully scrutinized, such figures will set a sound basis for establishing a fair method of overhead distribution applicable to the individual foundry and the type of castings produced.

Studies have shown three major points: (1) establishing average casting costs by the pound is dangerous; (2) overhead distribution should be settled only after exhaustive research into several methods of calculation; (3) every foundry should establish accurate cost controls, decide upon reasonable markups, and set selling prices to bring a fair return.

A major problem is in deciding by which method to apply overhead costs. Three methods have been suggested: distribution by the number of castings made, with each casting assuming the same amount of burden; distribution by weight, in which each casting assumes its burden according to its weight; and distribution on a percentage of the direct labor spent on producing individual castings.

The individual foundry has its own production problems—differences in manpower skills, experience, supervision, and mechanical equipment—which make for wide changes in production costs. Differences in size, type, volume, and class of castings also enter into the picture. Therefore it is sound to check the basic trend in casting cost changes by maintaining complete and accurate cost figures and continually analyzing the information collected. Comparing results over several months should indicate what sets the trend. There is no established formula. Only constant alertness and common sense will lead to a sensible solution.

The object of cost control should be cost reduction, which may be accomplished through greater productivity per man-hour, improved methods, better techniques, mechanization, and more economical use of materials. It must be remembered, however, that labor is the predominant cost factor in the production of castings. Only ever-increasing productivity per man-hour will make it possible to maintain or reduce selling prices, improve quality, and still pay higher wages. Unless high wages are accompanied by high output, costs and selling prices of castings will be too exorbitant to encourage their use as a structural material or to provide the volume of business necessary to utilize a fair per cent of the industry's potential capacity for useful production.

Making a separate oven for drying sand-lined ladles

C. C. SPENCER / *Melting Supt., Electric Steel Castings Co., Indianapolis*

Drying the sand linings of pouring ladles formerly required 8 to 12 hours, thus tying up much-needed core oven capacity. Building a separate unit for this job has cut the time required to 3 or 4 hours and provides an adequate supply of thoroughly dried sand-lined ladles without disrupting production in any department of the foundry.

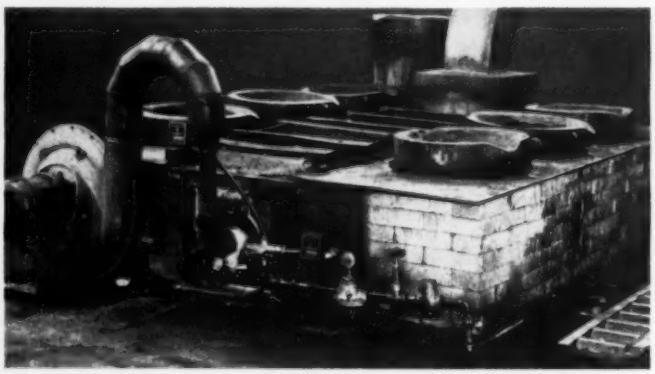
■ Molding sand linings for ladles are more suitable for some of our operations than linings made of ganister or brick. This is due to the ease with which sand linings can be constructed and later knocked from the ladle. Disposal of linings after each heat does away with the problem of carrying deposits of slag on the lining from heat to heat.

Our real problem was in satisfactorily drying the sand linings in our 800-lb capacity ladles. A direct flame on the ladle lining has a tendency to burn it. Past practice had been to dry the ladles in core ovens operated at 450 F, but this left much to be desired. It tied up core oven capacity during the entire day. Linings were not drying evenly. It was necessary to maintain two days' supply of lined ladles in the oven. Drying time varied from 8 to 12 hours.

Building the oven

It was decided to build a separate unit, designed to be fired from underneath and to dry the ladles solely by radiation. A double course of 9-in. standard fireclay brick was laid flat on the foundry floor, forming a rectangular foundation with outside dimensions of 82 x 98 inches which was used as the floor of the dryer. A double-course brick wall 24-in. high was then laid around the perimeter of this floor foundation.

Through the center a firing chamber 9 inches square was made by laying two rows of fire brick the length of the dryer, and by covering the top with arched fire brick. Ports were left open on both sides, so arranged that the flame would not play directly on the ladle shell. At the far end of the firing chamber a chimney was built, using four courses of the standard fire brick. The steel jacket over the chimney included a hooded stack through the foundry roof.



Here is the oven. Built by the foundry, it can dry six sand-lined ladles in three or four hours at 600 F, freeing core ovens for their regular work.

A half-inch steel plate was used to cover the unit. Holes were cut in the plate to permit six ladles, three on a side, to pass through and rest on the floor bricks with about ¾ of the ladles below the cover plate line. Hooks were welded on the sides of the ladles to permit loading with an overhead hoist.

Temperature is controlled by the burner output. The burner selected had a maximum rated capacity of 9.6 gal/hour. A solenoid valve is the heart of the control system. If the oil pressure fails, a pressure-sensitive controller closes the solenoid and shuts off the oil supply. If the blower fails, a second controlling element closes the solenoid and shuts off the oil. Power failure automatically stops both blower and oil supply.

For drying linings only

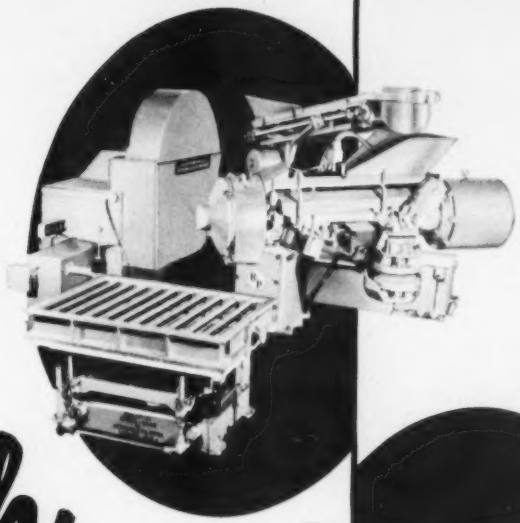
In our operation, the majority of heats are shank heats. Temperature of the steel from the electric furnace is about 3200 F, and molds are poured at about 2850 F. The steel can be poured either into cold ladles that are dry or into ladles pre-heated to only 300 F.

Even with this relatively low temperature we encounter no sculling of the ladles. Edges and contours of the finished casting remain sharp and clean. When pouring heavy castings we find it necessary to chill the metal somewhat by delayed pouring or stirring. Thus ladle pre-heating is no problem, and the oven is used specifically for drying the ladle linings.

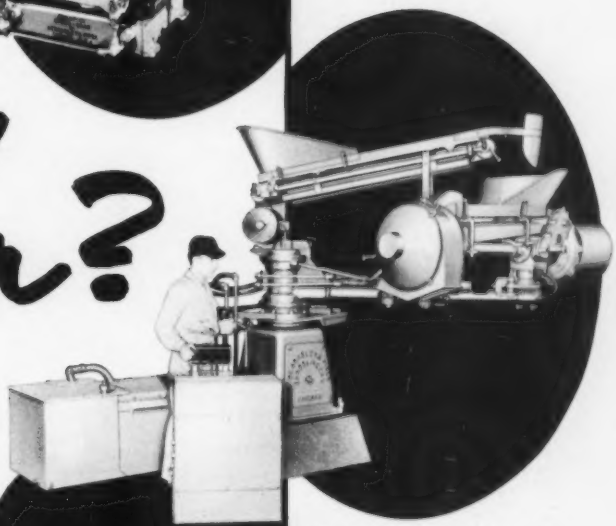
Results

This oven has been in operation for 18 months and has given excellent service. The result has been a conservation of core oven capacity and an adequate supply of thoroughly dried sand-lined ladles without disrupting production in any department of the foundry. Ladles are dried in this unit in 3 or 4 hours at 600 F, and it is only necessary to maintain a reserve supply to meet one day's operation.

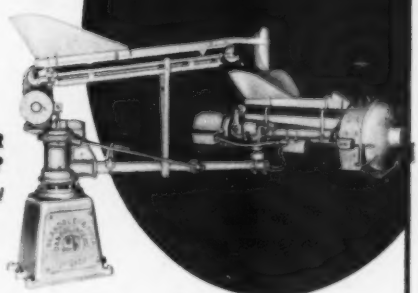
HIGHLY REPETITIVE WORK?
Ram with the Automatic Hydra-Slinger!



Which Slinger?



PRODUCTION WORK?
Ram with the Hydra-Slinger!



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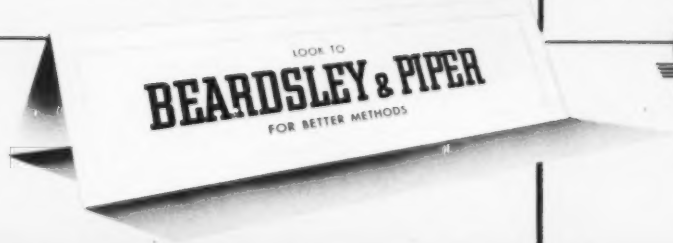

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Four of a battery of seven Champion **Bio-Matic** CB-15 Core Blowers making intake manifold cores at the Rouge plant. With Champions production per machine has been greatly increased on these manifold cores.

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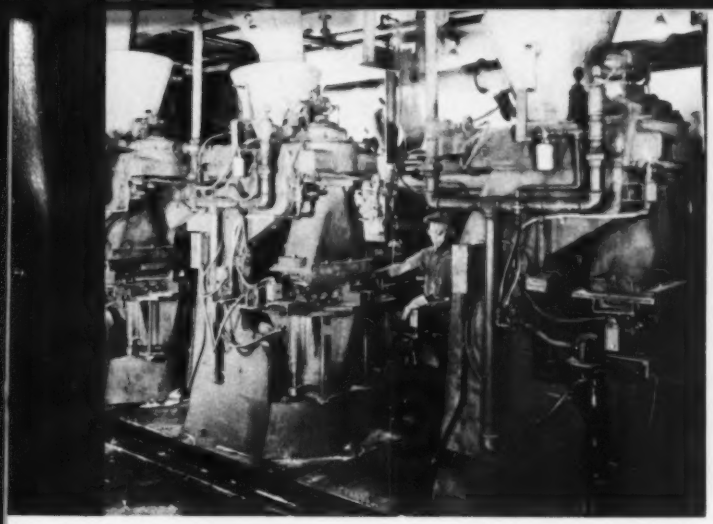

Three of a battery of six Champion **Blo-Matic** CB-15 Core Blowers making cylinder head cores at Ford Motor Company. The efficiency of these Champions is far higher than that of the core blowing machines formerly used on this job.

85 BLO-MATIC* CORE BLOWERS

ALREADY IN OPERATION AT FORD MOTOR COMPANY!

Eighty-five *Blo-Matic* equipped Champion Core Blowers are already in operation at the big Rouge plant of the Ford Motor Company and thirty-six more are slated for quick delivery. The Blo-Matic Champions have increased production over the former core blowing machines by a very substantial margin.

Blo-Matic times every operation in the core blowing sequence perfectly. The operator need only press a button to start the sequence. After that, clamping, blowing, drawing, and sand magazine refill operations take place quickly and automatically. The operator is free to handle a finished core and set up the next core box. *Blo-Matic* is positive, foolproof and above all, safe; it is designed and built to further improve the economy of operation that has long been a Champion feature.

***Blo-Matic:** The completely automatic electro-pneumatic system that precisely controls the entire core blowing sequence. Developed by Champion for high-production core blowing operations, *Blo-Matic* offers a choice of three forms of control—fully automatic, semi-automatic, and manual.

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1. *Jolt cylinder is internally ported—the exhaust blows the jolt anvil clean on every stroke.*
2. *A knee-valve controls the jolt and a single hand-valve controls squeeze and draw on the 513-6. Two convenient pilot valves control all operations of the 716-8, including the air-actuated swinghead.*
3. *Squeeze platen quickly adjustable for different height flasks. Lift pins may be adjusted for a wide range of flask sizes.*
4. *The 513-6 (illustrated) provides a full six-inch draw, while the 716-8 provides a full eight-inch draw.*
5. *Jolt guide pins work in hardened and ground steel bushings.*
6. *Positive, controlled slow and fast draw on the same stroke, with automatic vibrator control.*
   The length of slow draw on the 716-8 is automatically controlled.

	513-6	716-8
Table size	19" x 26"	24" x 34"
Jolt cylinder diameter	5"	7"
Squeeze cylinder diameter	13"	16"
Pattern draw	6"	8"
Jolt capacity	650 lbs.	1500 lbs.

J & J Jolt Squeeze Pin-Lift

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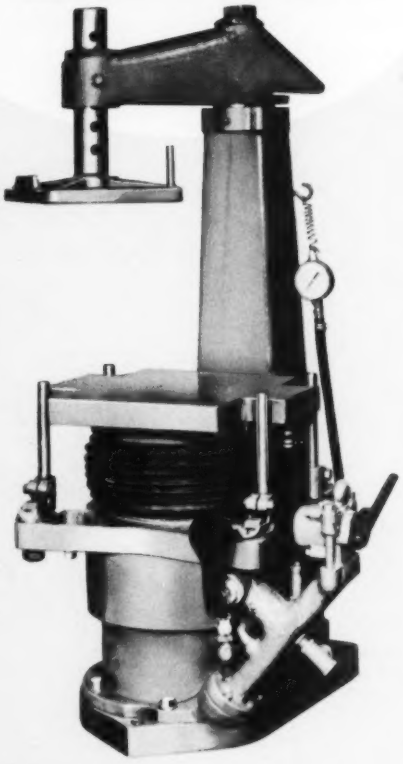

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Nodules and nuclei in nodular cast iron – part II

This is the second of two articles describing work on the metallography and constitution of nodular iron graphite at the Canadian Department of Mines & Technical Surveys. First article, covering an extended electron microscope study, was presented in the February 1952 issue of American Foundryman. This concluding article contains details of size distribution, chemical analysis, and x-ray diffraction studies. Work is published by permission of the Director-General of Scientific Services, Department of Mines & Technical Surveys.

J. E. REHDER / *Foundry Engineer, Department of Mines & Technical Surveys, Ottawa, Ontario, Canada*

■ Since previous metallographic studies produced evidence that "nuclear" material in nodular cast iron was relatively inert, chemically speaking, attention was given to separating the nodules out. Keel block coupons were cut into slices about ⅛ in. thick, and about three lb of these slices dissolved in cold five per cent sulphuric acid. The solution process took several days.

The iron sulphate solution was decanted off, and the residue of nodules and silica washed thoroughly by decantation. The residue, after transfer to a platinum dish, was treated with hydrofluoric acid to remove all silica by evaporation.

The remaining residue, consisting of nodules and some iron which may have been combined with the silica, was boiled in dilute hydrochloric acid to dissolve the iron, and transferred to a fritted glass crucible. The nodules were washed completely free of iron with hot distilled water, and dried at 100 C to constant weight. Examined under a microscope, the nodules looked like slightly dimpled buckshot, and were clean and non-adherent.

Samples of nodules were placed under a microscope with a calibrated eyepiece, and individual nodules were measured. When 1000 measurements taken at random had been obtained, the results were plotted to show size distribution. Graphs for three different irons are shown in Figs. 1, 2, and 3.

The type of size distribution for heats using copper-magnesium alloy

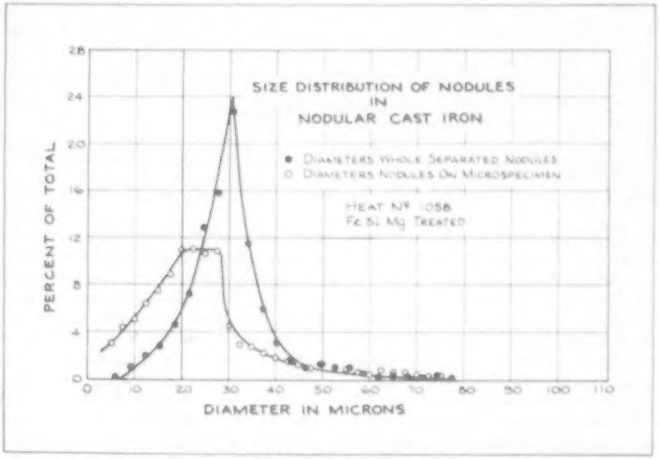

Fig. 1 . . . Size distribution of nodules from heat 1058 (FeSiMg treated). Also shown are apparent nodule sizes measured on metallographic specimens.

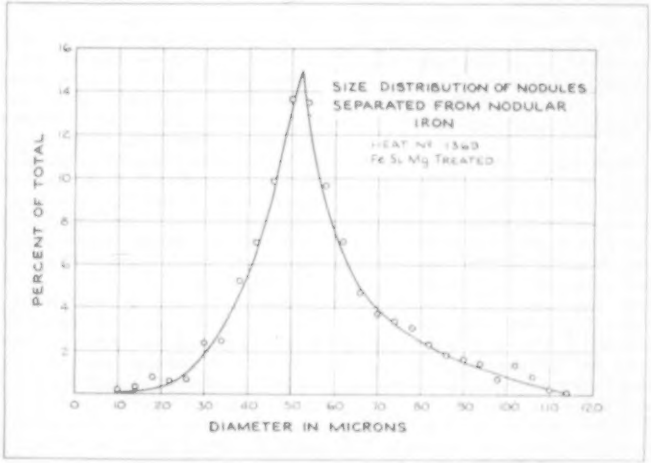

Fig. 2 . . . Nodule size distribution from heat 1360 (FeSiMg treated). Different peak location from that in Fig. 1 is believed due to use of post-inoculant.

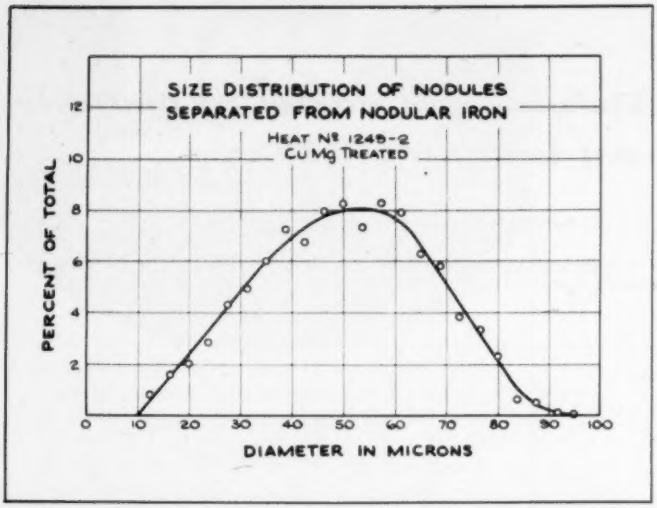

Fig. 3 . . . Size distribution curve for nodules from heat 1249 (CuMg treated).

as a source of magnesium differs from that for heats using iron-silicon-magnesium alloy as a source. The reason for this is not known. There is a considerable difference in the location of the peaks in the two iron-silicon-magnesium heats, possibly due to the fact that no post-inoculant was used in heat 1058.

Figure 1 includes the distribution of apparent nodule sizes measured on metallographic specimens cut from several of the keel block coupon slices before solution. These diameters are, of course, random cross-sections, but provide a measure of correlation between true nodule sizes and nodule sizes observed on a metallographic cross-section.

Chemical analysis

Since major interest lies in the chemical composition of the "nuclei" within the nodules, methods of obtaining a clean sample of sufficient size were explored. A primary consideration was that the non-metallic inclusions normally present in all cast irons (such as titanium carbide and titanium cyano-nitride) be completely separated and removed from the nodules, since the very large concentration factor might result in serious error.

Carbon content of these nodular irons is of the order of 3.00 to 3.50 per cent, and the separated nodules (including undissolved non-metallic inclusions) represent about three per cent of the original weight of iron sample, with the inclusions concentrated relative to the nodules by about 30 times. The "nuclear" material has been estimated to be of the order of one to three per cent of the weight of the nodules. If "nuclei" were separated from the graphite, their weight would represent at most about 0.1 per cent of the original weight of iron sample. Since the non-metallic inclusions would then be concentrated by a factor of about 1000, it is obviously imperative to separate the inclusions before analysis of "nuclear" material has any meaning.

Since size distribution data showed that the majority of nodules were considerably larger than the largest non-metallic inclusions likely to be encountered, simple screening would evidently allow non-metallic inclusions to fall through, with most of the nodules being retained on the screen. This procedure was adopted for samples from heat 1058, and the cleaned nodules were then ashed at a low temperature to constant weight.

Results of chemical analysis of this residue are given in Table 1. Total weight of the residue was found to be 2.28 per cent of the weight of the unashed nodules. The constituents are reported as oxides, since the material was completely oxidized during ashing of carbon.

The relatively large amount of titanium was surprising, although its source was evident. Most pig irons contain small quantities of titanium, usually 0.04 to 0.10 per cent, and when the large concentration factor is taken into account there is more than enough titanium present to provide the amount shown. It must be remembered that in Table 1, 10 per cent of titanium oxide represents only 0.0036 per cent titanium in the original iron. Since it is unlikely that a perfect separation of non-metallic inclusions was achieved by the sieving technique, at least some of the titanium found in the residue must be the result of oxidation of inclusions.

Considering the fact that this was a magnesium-treated iron, the practical absence of magnesium in the residue also occasioned some surprise, although this is consistent with the apparent chemical inertness of the "nuclei" as shown in previous electron microscope studies. This finding is considered significant, since it is a negative one that is not explicable on the basis of imperfect separation of inclusions.

There was some dissatisfaction with the sieving technique of separating non-metallic inclusions from nodules, since an appreciable quantity of small nodules were lost. Therefore, another method was devised. A heavy liquid was made up of carbon tetrachloride and acetylene tetrabromide to a specific gravity of 2.60, and the uncleaned nodules, after treatment with a little aerosol to promote wetting, were thoroughly stirred in.

After settling for 24 hours, the floating nodules and the precipitate were separated in a separatory funnel, and both portions were thoroughly washed and dried. There was insufficient precipitate for chemical analysis, but an x-ray diffraction film was obtained (as described later). A specific gravity determination was then made on the cleaned nodules, which were then ashed as before and analyzed chemically.

Results of this analysis are given in Table 2. The percentage recovery of nodules based on the original carbon content of the iron was 80 per cent; this recovery is usually obtained, although no attempt is made to recover the nodules quantitatively after solution of the iron. The residue from the ashed nodules was 1.4 per cent of the weight of cleaned unashed nodules.

Again, considerable quantities of titanium, iron, and aluminum were found, with magnesium in negligible amount. The presence of titanium and possibly aluminum may be at-

tributed to either imperfect separation of non-metallic inclusions, the presence of these elements in a "nuclear" material, or both. The presence of iron in the amount found is more difficult to explain. Assuming the presence of unseparated inclusions, it would seem unlikely that such a large proportion of iron would be dissolved in them. Washing the separated nodules was done with special care to eliminate all detectable traces of iron.

About five per cent of vanadium pentoxide is also shown. Further analysis has disclosed from 0.2 to 2 per cent of a long list of elements (such as molybdenum, barium, and phosphorus), and this has held true for other samples analyzed. Manganese and calcium are consistently absent. When it is considered that in mentioning one per cent of the ashed residue, quantities of the order of parts per million are being discussed, it is not surprising that a large number of different elements may be found.

Table 3 shows results of chemical analysis of ashed nodules from another heat, treated exactly as those for Table 2. Recovery of nodules was 78 per cent, and the residue from the ashed nodules was 2.1 per cent of the weight of cleaned unashed nodules.

The analyses of heats 1249 and 1369 do not add up to 100 per cent. The amount unaccounted for is believed to be the collection of small amounts of many other elements. More confidence is placed in analyses done on nodules separated from the non-metallic inclusions by the heavy liquid method than by the screening method.

Samples of cleaned nodules before ashing were mounted in lucite and examined under the microscope after metallographic polishing. The nodules and "nuclei" are apparently unchanged and unaffected by the separation techniques used, and are indistinguishable from those in the original nodular iron.

One serious defect of the ashing technique of separating the large mass of surrounding graphite from the "nuclear" material is that carbon and nitrogen, if present, would probably be lost. It is quite possible that the "nuclear" material is a complex iron-titanium carbide or nitride, and the techniques used give no information on this. Methods must be developed for cleanly separating "nuclear" material from graphite, leaving the former unaffected; but consideration of the relative amounts present, the inertness of graphite, and the very small size of the "nucleus" shows that this will not be easy. However, it must be done, and work is proceeding.

In order to make a comparison, a sample of plain gray cast iron was subjected to the graphite separation technique. The iron was similar in composition to the base irons from which the nodular irons were prepared. No attempt was made to separate the non-metallic inclusions from the graphite, an obvious impossibility due to the interlocking flake graphite mass obtained, in bulk volume about five times that of the same weight of nodular graphite. The flake graphite, washed free of iron, was ashed at low temperature to constant weight and the ash analyzed chemically. Ash weight was four per cent of the weight of the original graphite.

Results of chemical analysis of the ash are shown in Table 4. As in ashed nodular graphite, iron is present. Titanium and vanadium are also present, in about the same ratio to each other as in nodular graphite ash. Since no attempt was made to separate the non-metallic inclusions, the titanium and vanadium contents are probably entirely from their respective carbides and/or nitrides usually found in cast iron. The absence of alumina from the residue is noteworthy in view of its presence in the ash from nodular graphite, but the significance is not known.

It would appear, therefore, that at least some of the titanium found in the ash of nodular graphite is due to the presence of some unseparated non-metallic inclusions; but this cannot be the entire explanation of the composition of nodular graphite ash because of other differences.

Although it is not believed that any definite conclusions can be drawn from these analyses of graphite residues, a tentative summary of the points brought out can be made.

1. There is only a negligible amount of magnesium in the ash from nodular graphite, and any "nuclear" material must therefore also be low in magnesium content.

2. Ash from nodular graphite contains significant quantities of iron, titanium, and aluminum, not entirely explicable on the basis of retained non-metallic inclusions.

X-ray diffraction

All samples of cleaned nodules, separated non-metallic inclusions, and ashed nodules were subjected

TABLE 1

Chemical analysis of residue from cleaned, ashed nodules, heat 1058, FeSiMg treated.

Constituent	Per Cent
SiO_2	4.54
Fe_2O_3	46.08
Ti	29.63
MgO	1.91
R_2O_3 (mostly Al_2O_3)	14.85

TABLE 2

Chemical analysis of residue from cleaned, ashed nodules, heat 1249, CuMg treated.

Total weight, iron	1113.5 gm
Total weight, nodules	28.02 gm
Total weight, ashed nodules	0.384 gm
Specific gravity, nodules	2.22 gm

Constituent	Per Cent
SiO_2	0.68
Fe_2O_3	21.93
TiO_2	44.04
MgO	2.20
V_2O_5	5.07
R_2O_3 (mostly Al_2O_3)	15.60
CaO	—
MnO	—

TABLE 3

Chemical analysis of residue from cleaned, ashed nodules, heat 1369, FeSiMg treated.

Total weight, iron	1250.0 gm
Total weight, nodules	31.1 gm
Total weight, ashed nodules	0.647 gm
Specific gravity, nodules	2.22 gm

Constituent	Per Cent
SiO_2	0.98
Fe_2O_3	25.25
TiO_2	29.80
MgO	4.51
V_2O_5	4.11
R_2O_3 (mostly Al_2O_3)	15.80
CaO	—
MnO	—

TABLE 4

Chemical analysis of residue from ashed flake graphite from gray cast iron.

Constituent	Per Cent
Fe_2O_3	13.5
TiO_2	70.2
V_2O_5	11.7
P_2O_5	6.6

to x-ray diffraction analysis. This work was done on a unit using a 57-mm powder camera. Cobalt radiation was used with an iron filter at 35 kilovolts and 20 milliamperes.

Clean unashed nodules showed a well-defined graphite pattern, as would be expected. Cleaned *ashed* nodules produced x-ray diffraction patterns of some complexity, and some lines are still unidentified. However, definitely present were TiO_2 (as rutile) and Fe_2O_3. Not present were SiO_2, MgO, Fe_3O_4, FeO, FeS, SiC, C, and $FeO{\cdot}TiO_2$. Although Al_2O_3 was not positively identified, it cannot be finally considered not present.

The absence of silica and magnesia is understandable in view of the small amounts present. The absence of iron titanates and the presence of rutile suggests that the titanium was free, or more probably present originally as a carbide or nitride.

Good patterns from the separated non-metallic inclusions were more difficult to obtain. Again, several lines could not be indentified. Definitely present were TiC, C, SiO_2; tentatively identified as present were VaC and TiN. Not present were TiO_2, ZrC, Mg_3N_2, MnS, Mg_2C_3, Fe N, and Fe_4N. The graphite was probably adherent.

In brief, it is considered that the presence of iron, aluminum, and titanium in the ashed nodules as found by chemical analysis is confirmed. Interesting conjectures as to the original state of combination before ashing, made on the basis of compounds found to be present or absent, must remain guesses for the time being.

Future work

Although considerable information has been gained, the question of the composition and structure of the "nuclear" material is still not completely answered. The ashing method of separating the graphite of the nodule from the "nuclear" material has two disadvantages. "Nuclear" material is converted to oxides, with carbides, sulphides, or nitrides, if present, also probably decomposed to oxides; and the original inter-metallic associations are lost. It would seem to be essential to separate the "nuclear" material from the graphite of the nodule without chemical change.

This is not easy, since graphite is an inert material and the "nuclear" particles are extremely small. The obvious method would be to grind cleaned nodules in a mortar or mill to a particle size similar to that of the "nuclei", and then separate the graphite from the "nuclear" material by a heavy-liquid separation at about 2.50 specific gravity, since the "nuclei" are almost certainly of considerably higher density than graphite. However, the nodules are exceedingly difficult to grind due to the self-lubricating power of graphite. Even after long-continued grinding a large proportion of the nodules are still whole or merely cracked. Furthermore, even if satisfactory grinding could be accomplished, the heavy-liquid separatory technique presents major difficulties with such very fine particles due to low settling rates and absorbed air.

The attempt to obtain electron diffraction patterns by mounting separated nodules closely packed in lucite and hoping that a polish of the specimen would leave the "nuclei" in bold relief was a failure, since sufficient relief could not be obtained.

It was noted that cleaned separated nodules could be picked up by a magnet, and further study showed them to have definite magnetic properties. The use of a translation balance and the methods of magneto-chemistry showed that as the temperature of separated nodules in vacuo was increased, the magnetic susceptibility showed a sharp and large decrease at about 500 C.

Comparison with susceptibility-temperature curves for other materials has failed to identify the material or compound responsible. When an attempt was made to plot the susceptibility-temperature curve for flake graphite separated from gray cast iron, it was discovered that it was too low to be measured accurately on the apparatus available.

The magnetic susceptibility of nodular graphite is therefore apparently many (some 20 or 30) times that of flake graphite, and cannot be attributed to accompanying non-metallic inclusions as comparison of analyses in Tables 3 and 4 will show. The reason for this anomalous behavior is not known at present, but work in this direction is continuing.

Conclusions

Answers to the questions of the mechanism of nucleation of nodular graphite and the constitution of the apparent nucleus have not been provided by this or previous work (see February 1952 AMERICAN FOUNDRYMAN, pp 44-48). It is not considered that the presence of a discrete nucleus in spherulitic nodules has been proven, although the weight of evidence is in this direction. Total findings are summarized below, with some of the tentative conclusions that have been drawn.

1. Metallographic evidence indicates that nodular graphite is formed by growth or deposition of graphite on specific "nuclei".

2. Two patterns of structure in nodular graphite are found, radial and non-radial. This may be due to the time of precipitation during the solidification of the iron, the radial type precipitating later.

3. There is possibly a "nucleus" present in most, or all, nodules; this "nuclear" material is very hard and chemically inert. The crystal habit of the "nuclear" material is believed to be hexagonal.

4. The type of size distribution of the nodules in nodular iron is apparently affected by the alloy used to introduce the magnesium.

5. Chemical analysis of the ash from cleaned, ashed, graphite nodules from nodular iron shows iron, titanium, and aluminum to be major constituents. The presence of these elements is not believed to be entirely accounted for on the basis of non-metallic inclusions.

6. Magnesium is present in negligible amount in the ash from nodular graphite, and must be in small proportion in such "nuclear" material as may be present.

7. The nodules of graphite from nodular iron are attracted by a magnet, and the magnetic susceptibility-temperature curve shows a major decrease in susceptibility at about 500 C. The order of difference in susceptibility between nodular graphite from nodular iron and flake graphite from gray cast iron is apparently 20 to 30 times.

Acknowledgments

The examination of samples with the electron microscope and the resulting photographs were by Dr. F. W. C. Boswell. Metallographic samples were prepared and nodule size distribution counts were made by J. E. Wilson. Separation of the nodules from iron and chemical analysis of residues were by A. E. LaRochelle and A. J. Fournier. X-ray diffraction work was by B. G. Olivier, and magnetic susceptibility measurements were taken by H. M. Weld. Their co-operation is gratefully acknowledged.

Effects of annealing on the removal of burned-on sand

A recent graduate of Michigan State College offers an approach to the change in ease of removing burned-on sand from castings before and after annealing. The explanation, in terms of physical rather than chemical changes, is supported by micrographic studies of two test castings taken from normal production runs.

DONALD ALVERSON / *Core Room Supv., Eaton Mfg. Co., Vassar, Mich.*

■ Increased difficulty in removing burned-on sand from castings after annealing can be attributed to a physical rather than to any chemical change, according to experiments conducted at the permanent mold iron foundry of Eaton Mfg. Co. This change takes place at the iron-sand interface, and is a direct result of the annealing cycle.

To demonstrate this, two test castings were taken from normal production. Both contained cored holes; they were cast four months apart, in conjunction with sharp sand cores dipped in a commercial blacking at 45 Baumé. Sectioning (as shown in Fig. 1) revealed burned-on sand in both cases, taking the form of shallow metal penetration.

In addition to the section drawing, Fig. 1 also shows the physical form and method of defect formation. Due to excessive heat and pressure occurring under the heavy section of these cored castings during solidification, the core binders were destroyed in the zone immediately under the core wash. This allowed small runners of iron to break through the unsuppported core wash and surround the first few layers of sand grains, thus forming a thin scab of sand bound tightly to the casting by a network of iron.

Fig. 1 . . . At left is shown the method of sectioning. At right is shown the physical form and the method of defect formation studied here.

Before annealing

Samples of as-cast iron were polished and etched in nital. The microstructure of one typical runner found in the first casting is shown in Fig. 2.

The structure is almost entirely pearlitic with large amounts of what

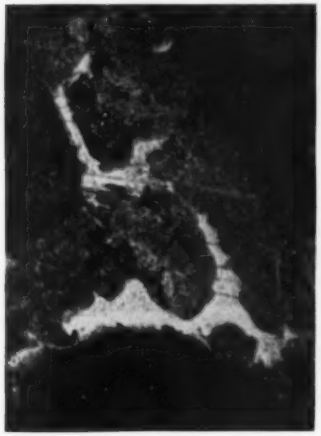

Fig. 2 . . . Before annealing, structure of the runner is almost all pearlite with some steadite. (X500)

Fig. 3 . . . After annealing, small runner is almost all ferrite and graphite, with no pearlite showing. (X500)

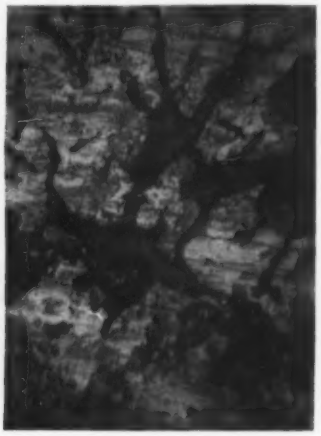

Fig. 4 . . . But large runner still contains some pearlite with large graphite flakes not found before. (X500)

appears to be steadite occurring throughout. In other runners some cementite was present, along with graphite flakes. A structure such as the pearlite-steadite combination would be very brittle; any rough handling would tend to fracture the iron network and break the scab of sand and iron from the casting. The structure of the second casting varied only in having less steadite.

After annealing

Both samples were then put through an annealing furnace at 1650 F in open containers, repolished, and etched. Observation under a microscope revealed no sign of an oxide film between the surface of the casting and the iron and sand.

The typical microstructure of one of the smaller runners is shown in Fig. 3. The pearlite has almost completely broken down to ferrite and graphite, with the steadite dissolved in the ferrite matrix.

In these small runners the pearlite was completely absent, but in several of the larger runners some pearlite was still present along with large graphite flakes (Fig. 4). Graphite flakes were not found in the small runners; graphite occurred in small globules. This type of structure is much tougher due to the greater ductility of the ferrite over the pearlite-steadite structure found prior to annealing. Much more energy would be required to separate the burned-on sand from the casting.

From this evidence it is concluded that the increased difficulty in removing burned-on sand after annealing is due purely to a physical change—the breaking down of the pearlite-steadite combination into the less brittle ferrite matrix—and not to a chemical change such as the formation of an adherent oxide film between the two surfaces.

▸ *Install U. of Michigan Student Chapter*

■ Twelfth in the family of A.F.S. student chapters was officially installed the evening of February 27 at the University of Michigan, Ann Arbor. Present at the banquet ceremony were officials of A.F.S. and the Foundry Educational Foundation, faculty and students of the University, and prominent Michigan foundrymen and industrialists.

First speaker, Faculty Advisor G. A. Conger, introduced Student Chapter President Ray Decker, who presided over the remainder of the meeting.

Paul Manganus of Warren Alloy & Machine Co., gave a brief talk in which he outlined topics to be discussed by other speakers on the program. Following him, Larry DeBoer, FEF scholarship student, told of his trip to the Foundation's Annual Convention.

Next, Edward C. Hoenicke, Eaton Mfg. Co., Vassar, Mich., toastmaster for the occasion, introduced distinguished guests to the new student members.

Three foundrymen prominent in A. F. S. educational activities—Vice-Presidential Nominee Collins L. Carter, Albion Malleable Iron Co., Albion, Mich.; National Director Harry W. Dietert, Harry W. Dietert Co., Detroit; and Past President Fred J. Walls, International Nickel Co., Detroit, spoke on the advantages of membership in A.F.S.

High point of the meeting came when A.F.S. National Secretary-Treasurer Wm. W. Maloney presented the cast iron rattle symbolic of chapterhood to University of Michigan Chapter President Decker.

The installation ceremonies concluded with words of advice and encouragement to the students by Professors O. W. Boston, chairman of production engineering, and E. T. Vincent, chairman of mechanical engineering. Last program speaker, Professor C. C. Sigerfoos, faculty advisor to the A.F.S. Michigan State College Student Chapter, related experiences in operating a successful A.F.S. Student Chapter.

A.F.S. University of Michigan Student Chapter members are: President Raymond Decker. Vice-President Philip Lunetta, Secretary A. J. Terry Brown, Jr., and Treasurer Sumio Yukawa.

Gopal Agarwal, Kirk Buddington, Robert S. Carey, Carl A. Corneliuson, Ricardo Cortes, Larry DeBoer, David Guttentag, John Harris, A. J. Hayes, Anthony Kudela.

Paul Malloy, Leonard Martin, Jr., James Pappos, Richard A. Pereles, Michael A. Roman, Jr., John P. Rowe, Harold E. Serface, H. M. Smith, R. L. Sonnenberg, William H. Strickler, J. F. Watson, R. P. Wegter, D. Weigel, D. B. Wile, James Woodard and S. L. McComb.

Faculty members of the student chapter are: Faculty Advisors G. A. Conger and R. A. Flinn, C. W. Philips, W. A. Spindler, Clarence Upthegrove, and William Pierce.

Officers of the newly installed University of Michigan Student Chapter are, left to right, standing: Secretary Jack Rowe, President Ray Decker (holding cast iron rattle symbolic of A.F.S. chapterhood), Faculty Advisor R. A. Flinn, and Vice-President Phil Lunetta. Seated, left to right: Program Committee Chairman Rodney Sonnenberg, Treasurer Sumio Yukawa, and Faculty Advisor G. A. Conger.

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Redesigned for gray iron casting production

Substitution of gray iron castings for non-cast materials is recognized annually through the Gray Iron Founders' Society Redesign Contest. Last year's winners are described here. The 1952 GIFS competition with new prizes totalling $500 for the winners was announced recently by the Society.

• Best examples of redesign for production in gray iron entered in the last Gray Iron Founders' Society Redesign Contest were a cast iron crankshaft, a yoke for a mold conveyor, and an outboard bearing stand for a large engine. The designs were submitted, respectively, by W. E. Eccles and T. O. Kuivinen, Cooper-Bessemer Corp., Mt. Vernon, Ohio, first prize, $200; Joseph L. Grenko, Textile Machine Works, Reading, Pa., second prize, $100; and J. Douglas James, Cooper-Bessemer Corp., Grove City, Pa., third prize, $50.

The cast iron crankshaft was substituted for a forged steel crankshaft in an 8-cylinder diesel engine (Fig. 1). The cast crankshaft was 15 ft 3 in. long with 9 in. diameter crankpins and main journals. The copper-chromium-molybdenum inoculated iron used had a tensile strength of 56,230 psi measured on a 2 in. diameter arbitration bar poured from the same ladle as the shaft.

The crankshaft was installed in an 850 hp diesel engine, going into operation January 20, 1944, and running 24 hours a day seven days a week almost without interruption. In March 1951, in the course of a general overhaul, the pins were carefully measured and the micrometer readings compared with those recorded at the time the shaft was produced. The shaft was in perfect condition with maximum wear of only 0.005 in. after seven years of operation.

Cast iron was selected for the crankshaft because on this design

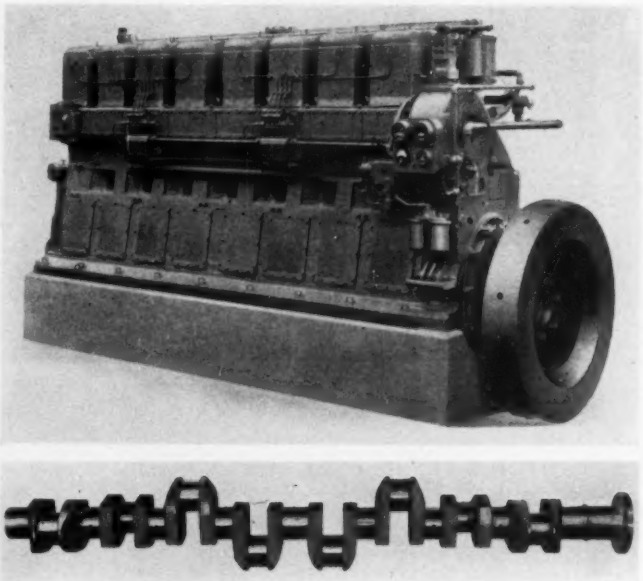

Fig. 1 . . . Fifteen foot cast iron crankshaft replaced forged steel shaft in 850 hp diesel engine. Maximum wear was only 0.005 in. after seven years.

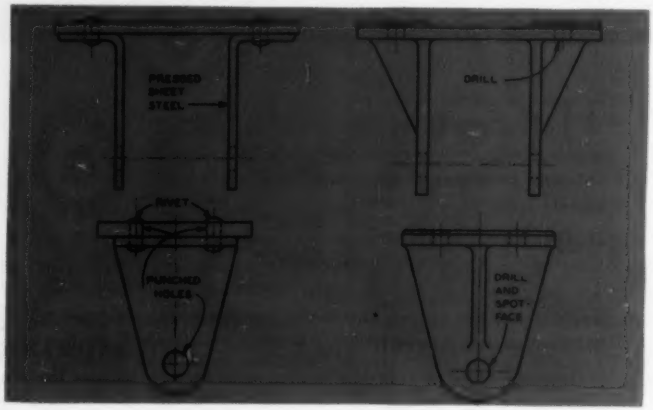

Fig. 2 . . . Cast iron yoke for mold conveyor (far right) was more durable and more rigid than riveted sheet steel yoke (right) it replaced.

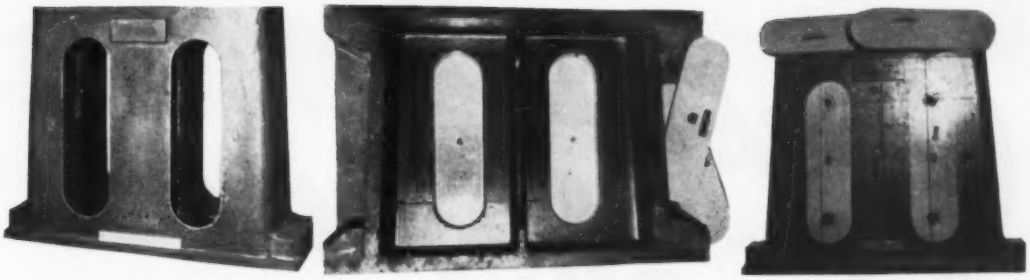

Fig. 3 . . . Casting outboard bearing stand (above) saved 23 per cent on original order of 40 when gray iron replaced welded steel construction. Gray iron easily met rigidity and damping requirements. Combination cope and drag pattern with removable coreprints, and split core box which makes both halves of core cut initial costs.

it was known that its structural durability was adequate to withstand maximum calculated stresses, cost was 45 per cent lower than the forged steel shaft, 10 years' field testing indicated that the cast iron had superior resistance to wear, and factors of safety were adequate.

Reduce conveyor breakdown

The mold conveyor yoke (Fig. 2) redesigned for gray iron was formerly fabricated from two pieces of sheet steel. The bottom plate had holes punched for rivets while the two side plates were punched for rivets and for a wheel shaft, then were bent 90 degrees for assembly.

Holes for the shaft did not line up on true center and the wheel could readily be pulled out of line, indicating lack of sufficient rigidity. On attaching the wheel and yoke assembly to the conveyor, it was found that the intended work was not being performed. The wheel did not run true on the track and the face flanges wore in a short time. Mold production was lost due to eventual breakdown of wheels and molds were lost due to erratic up and down motion of worn wheels.

In redesigning for cast iron, a rib was added for additional support and wheel shaft holes were drilled on a jig to insure perfect alignment. Cost was not appreciably different.

The cast iron yoke was more durable and rigid. Holes were perfectly on center, insuring a true run of the wheel on the track, and breakdown of the system due to this cause was eliminated.

The outboard bearing stand shown in Fig. 3 was converted from welded construction to cast iron during a study of more economical methods of producing an engine. Engineering requirements for the part, used to support the lower bearing on the end of generator shaft directly connected to the engine, included rigidity and some damping capacity.

Cost figures on the initial order of 40 castings show a saving of 18 per cent in favor of the castings, including the cost of the pattern equipment. Saving on subsequent runs was 23 per cent.

The new design for cast iron was made to allow use of a half corebox and a half pattern, simplifying core and mold production and reducing initial equipment costs. In molding, core prints are used in the drag only. The drag half of the core is made without the loose pieces to give the core prints. The cope half of the core is made with the loose pieces in the box so the upper projections just meet the upper surface of the mold cavity when the mold is closed. This eliminates the hazard of blindly seating cope core prints and is standard practice with Cooper-Bessemer.

now, there's an idea!

Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. *Now, there's an idea!* helps American Foundryman readers promote the exchange of ideas, the motivating force behind the American Foundrymen's Society. Contributions for publication are solicited. They may be of any length, preferably short, preferably illustrated by photo or sketch.

■ Before Ed Gallagher (below) of Electric Steel Foundry Co., Portland, Ore., suggested using ladle bearings machined from electrode butts, three or four hours a day were spent removing handles, collars, and bearings for bearing maintenance. Metal bearings froze regularly due to loss of grease from the heat. Since installation of graphite bearings greasing is not required and savings include an hour a day for greasing, as well as the time required to repair and clean the bearings previously used. In addition, ladles are not tied up in maintenance. Ed received $288 from his company for the idea turned in through the plant suggestion system.

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Bird's-eye view of the Fanner Brookside Park plant in Cleveland.

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Shop talk

Practical questions and answers

▶ Sand fineness

We have just received an inquiry for zircon sand "with body A.F.S. fineness ±100". We always use either the Tyler or U.S. Standard Screen Scale. What is the equivalent of A.F.S. fineness ±100 in either the Tyler, U.S., or Micron designation?

Unfortunately, there is no simple conversion from either Tyler or U.S. Standard Screen scales to A.F.S. fineness numbers. A.F.S. fineness numbers are a composite numerical value based upon the relative amounts of a given sample of sand retained on various standard sieve sizes. However, the method of obtaining A.F.S. fineness numbers is detailed in the A.F.S. FOUNDRY SAND TESTING HANDBOOK.

▶ Zinc recovery

We are interested in recovering zinc residues with a content of 50 per cent metallic zinc. We would also like to refine hard zinc from galvanizing pots. Any information on methods and equipment would be greatly appreciated.

Either set up a small retort furnace or ship these residues to a zinc smelter who has this equipment.

A retort furnace consists of a refractory retort located inside a combustion chamber, fired with gas, oil, or powdered coal. The residues to be refined are mixed with crushed anthracite coal and the retort temperature raised until a strong reducing atmosphere is created within the retort by the burning coal, which in turn reduces the oxides and causes the zinc to vaporize.

The zinc vapors are then condensed in a refractory condenser which is more or less pear shaped, and sealed to the end of the retort which projects out of the furnace wall.

At intervals the zinc vapor which condenses is withdrawn. This zinc will be relatively high in purity unless the residues contain considerable quantities of either lead or cadmium, both of which would likewise be reduced and are volatile at temperatures at which zinc vaporizes. Separation from iron, however, is almost complete.

Generally speaking, we would question the advisability of building such an installation because of the substantial initial capital investment. We believe it would be better to sell these residues to a zinc smelter, if possible.

▶ Coke residue

During the course of a year we accumulate about 300 tons of small coke and coke breeze which range in size from 2 in. down to 14 mesh.

We have tried to burn this material mixed with coal in our stoker-fed steam boilers as well as in the open salamanders used for heating our foundry, but these uses have not been too successful. Is there any type of heating unit that uses this material for fuel?

We know of no satisfactory method of burning coke in such small sizes. However, we suggest you investigate the possibility of briquetting it, using a pitch binder, and then burning or selling these briquettes.

▶ Melting stainless steel

We wish to know the process for melting stainless steel. We intend to make round bushings from it, but know nothing about the process.

Stainless steel generally should have an end carbon content of less than 0.03 per cent. In addition to starting with raw materials that are very low in carbon, it is important to avoid carbon pick-up during the melting operation.

For this latter reason, the high frequency induction furnace is usually recommended, although the 3-phase arc furnace is also often used. Regardless of type, the furnace is almost invariably lined with a basic lining.

The metal charge may be carefully selected stainless steel scrap of proper composition; or low phosphorus, low sulphur, low carbon steel scrap to which must be added the requisite quantity of low carbon ferro-chromium and nickel to produce the desired end composition. The former method is by far the easiest, and in small operations it is the usual method when a suitable source of stainless steel scrap is available.

The actual melting operation requires rather careful metallurgical control and considerable experience. Unfortunately, we know of no published material which specifically relates to the precise detailed technical method of making stainless steel melts, and we hardly think it wise to attempt the production of stainless steel without a well-qualified man. Therefore we recommend that you employ a consultant for this purpose.

▶ Flame hardening

We are getting numerous requests for gray iron castings that can be flame hardened, and have no data on the analysis for this type of iron. If you have any information on flame hardening iron, we would greatly appreciate your help.

Flame hardening of cast iron is not too difficult if the basic rudiments are carefully observed.

All gray irons will not successfully flame harden. In this respect, gray iron is no different than steel; sufficient carbon must be in solid solution to provide hardenability. The combined carbon content of the gray iron should be between 0.60 and 0.85 per cent, and should be devoid of free ferrite and free pri-

continued on page 138

FOR LADLE INOCULATION

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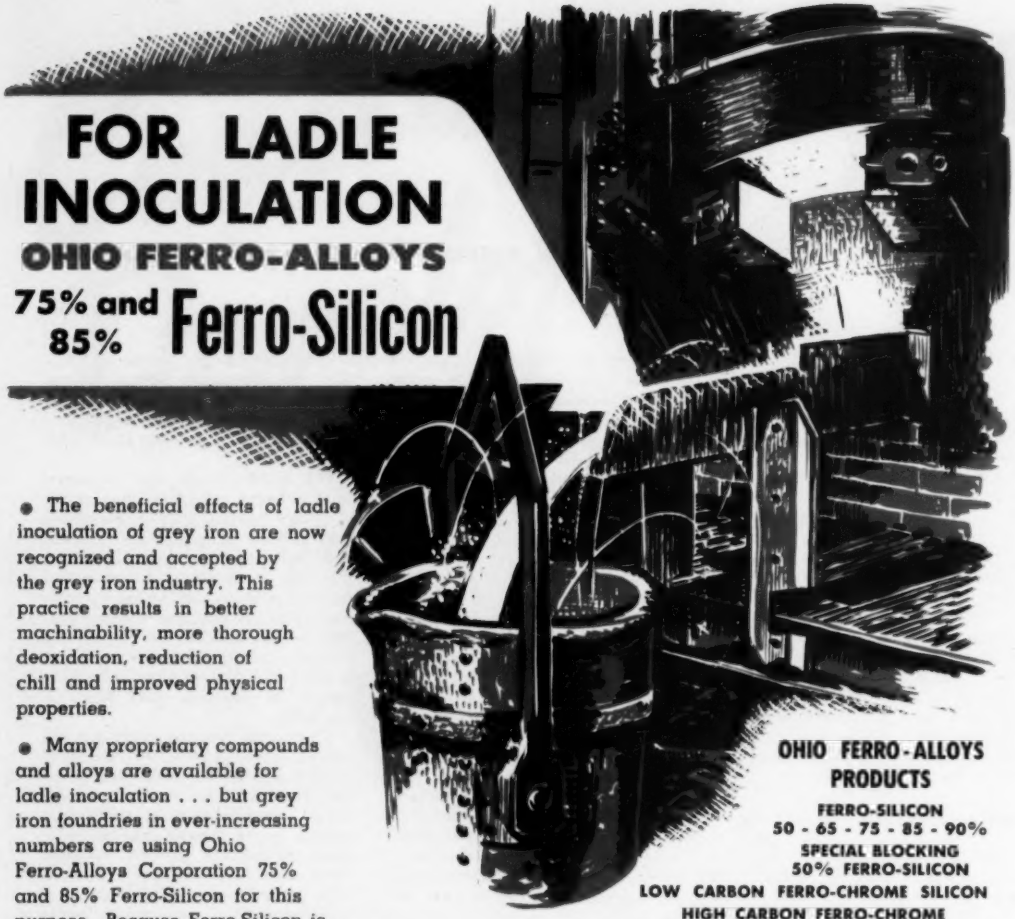

• The beneficial effects of ladle inoculation of grey iron are now recognized and accepted by the grey iron industry. This practice results in better machinability, more thorough deoxidation, reduction of chill and improved physical properties.

• Many proprietary compounds and alloys are available for ladle inoculation . . . but grey iron foundries in ever-increasing numbers are using Ohio Ferro-Alloys Corporation 75% and 85% Ferro-Silicon for this purpose. Because Ferro-Silicon is both economical and efficient, it will pay you to investigate the use of these general-purpose inoculants in your foundry.

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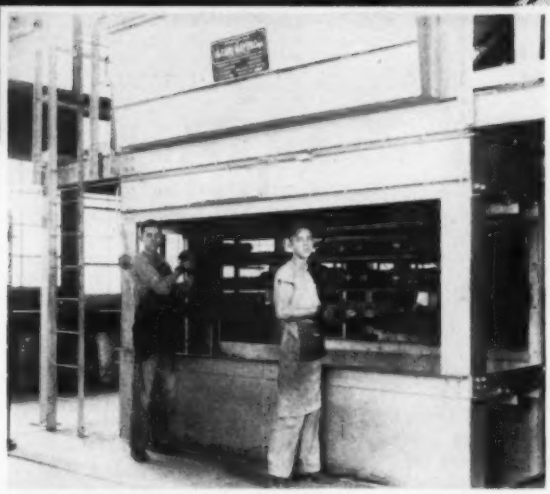
IMPORTANT DEVELOPMENT

Fan inside of oven



CARL-MAYER VERTICAL CORE OVEN (unloading position) at A. C. Williams Co.

CONSIDER THE ADVANTAGES OF THIS EXCLUSIVE HEATING ARRANGEMENT

- Saves platform space.
- Eliminates external heat duct, reducing heat losses.
- Placing heat fan in oven also reduces heat losses, resulting in high operating efficiency.
- By eliminating external heat duct and fan insulation, it reduces installation cost.
- There is no smoking as from external heat ducts.
- Oven appearance is greatly improved.

Carl-Mayer Vertical Core Ovens, with the heating system described, are protected by Patent No. 2,257,180. Other patents pending.

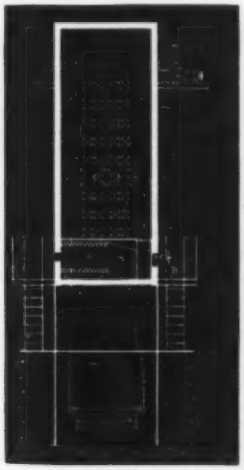


Fig. 1

NEW METHOD with heat fan inside oven.

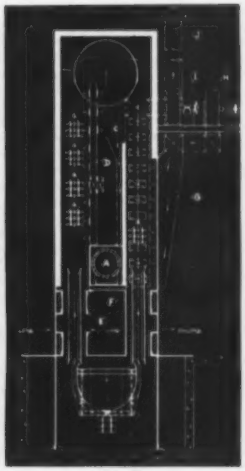


Fig. 2

Section showing conveyor travel thru pass, heating, cooling and exhaust system.

Vertical Ovens (Figs. 1 and 2) are by Carl-Mayer, using the universal adopted recirculating heating system with sealed combustion chamber located between conveyor chains.

- **WRITE FOR COMPLETE DATA** ON THIS AND OTHER VERTICAL OVEN FEATURES, GUARANTEEING FASTER BAKING, LOWER FUEL CONSUMPTION, SMALLER CORE LOSSES, SAFER OPERATION, ELIMINATION OF SMOKE, COOLED CORES AT UNLOADING POSITION, REDUCED LABOR COST.

—•—

Carl-Mayer Continuous Monorail Core Ovens

One of the largest monorail installations in the U.S.A. (patent no. 2,355,814) made for the Ford Motor Company. Each oven is 170' long, utilizing 1,200 feet of continuous monorail conveyor. Following are some of the outstanding advantages of these ovens:

- Flexibility in core handling, bench to core rack.
- Uniform, fast baking, using the "Mayer" convection heater.
- Cores can be removed with bare hands at unloading station using Carl-Mayer patented design. Patent 2,355,814.
- Smoke nuisance is eliminated.

Typical Users of CARL-MAYER VERTICAL AND MONORAIL OVENS

Aluminum Co. of America
American Radiator Co.
Buick Motor Co.
Burt Foundry Co.
Cadillac Motor Co.
Eclipse Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
G. & C. Foundry Co.
General Motors Corp.
General Steel Castings Co.
Harrison Radiator Co.
Henry Kaiser
H. B. Salter Co.
McKinnon Industries
Quality Castings Co.
Packard Motor Co.
Richmond Radiator Co.
Union Brass and Metals Mfg. Co.
West Michigan Steel Castings Co.
A. C. Williams Co.

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CORE AND MOLD OVENS, ALL SIZES. ALSO OTHER TYPES OF INDUSTRIAL OVENS, FURNACES.

SELF-CLEANING BUCKET PROVES ADVANTAGES IN ACTUAL USE

About three years ago, an elevator conveyor bucket of radically different design was placed on the market. A foundry engineer designed it—an engineer who had been confronted with the problems presented by the ordinary bucket for years, and who decided that something practical could be done about it. Today, thousands of buckets of this new design are in use throughout the country, as foundries and other companies try them, equip completely with them, re-order again and again.

The major problem that this M-T-MATIC Bucket solves so successfully is to prevent sticky sand from building up in bucket bottoms. With old-fashioned buckets this build-up gradually reduces actual carrying capacity of each bucket during a day's operation, until finally only a handful of sand is being discharged on each trip.

The customary remedy, when buckets begin to clog, has always been to bang them with something—which is hard on buckets, hard on belts, and still means low-efficiency performance between whacks. And constant bucket replacement and belt repair is expensive.

Like so many good ideas, a practical solution was simple—once somebody thought of it. Just make the bucket in two parts, instead of one, and you have a built-in leverage which no sand-plug, even when wet and hard packed or half-frozen, can withstand. The back of the bucket becomes a "Stripper-Plate", mounted to the belt *separately* from the rest of the bucket, yet sacrificing nothing in pick-up or capacity.

As the Stripper-Plate, on its separate mounting, approaches the head-pulley of the conveyor, it follows the radius of the pulley, starting around *before* the mounting of the bucket itself is affected. This action thrusts the plate forward and up, irresistibly dislodging the entire contents of the bucket. Sand simply can't stick—it *must* discharge completely as the bucket itself comes over the top of the pulley.

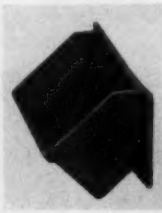
Soon after the introduction of M-T-MATICS (which received a clear patent on their novel construction), foundries began to try them. They put a few on a belt for test—ordered more—equipped other conveyors. Results? Here's a quote from a Mid-Western foundry:

"In our judgment, this change (to M-T-Matics) increased our sand carrying capacity at least 30%. We feel the figure of 30% is a conservative statement."

There are now thousands of M-T-MATIC Buckets in use in the foundry industry and in other applications such as handling sand and gravel in material yards, coal, and other granular materials. They afford big savings not only because complete delivery of sand is assured with *every* trip of each bucket, but also because buckets last much longer when they aren't banged and battered every hour on the hour, day after day. What's more, mounting the Stripper-Plate and the bucket itself separately takes a great deal of strain off the belt; each part follows the contour of the head pulley closely and easily, and there is a minimum of stretching, or popping bolts.

M-T-MATIC Buckets are made in a complete range of standard sizes to fit all elevator conveyors, and can be produced to fit special dimensions. Deliveries are prompt. And you can't lose by trying M-T-MATICS, because if for any reason they do not measure up to and beyond your expectations, PEKAY will gladly take them back and replace them with standard buckets (of which PEKAY also makes a full line).

Thousands of M-T-MATIC Buckets are saving thousands of dollars, through greater efficiency and longer belt life, for foundries and other sand-handling companies everywhere. They can do the same for you. Try them and see—send the coupon today!



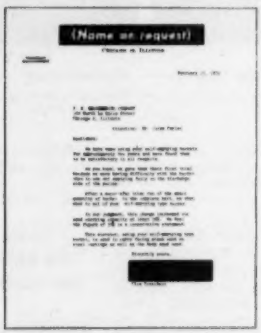
STANDARD PICKUP CAPACITY

***SEPARATELY MOUNTED* BACK ACTS AS STRIPPER-PLATE TO ASSURE *COMPLETE* EMPTYING—IRRESISTIBLE LEVERAGE SWEEPS BUCKET CLEAN**

Here's how the patented

PEKAY M-T-MATIC

ELEVATOR CONVEYOR BUCKET *automatically cleans itself on EVERY trip . .*



THIS FOUNDRY REPORTS:

"In our judgment . . increased our carrying capacity at least 30% . . conservative statement."

PEKAY MACHINE & ENGINEERING CO.

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Gentlemen:

Please send me prices on M-T-MATIC Buckets. Size of Buckets we are now using is_____

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Jolt Rollover Draw, Model A

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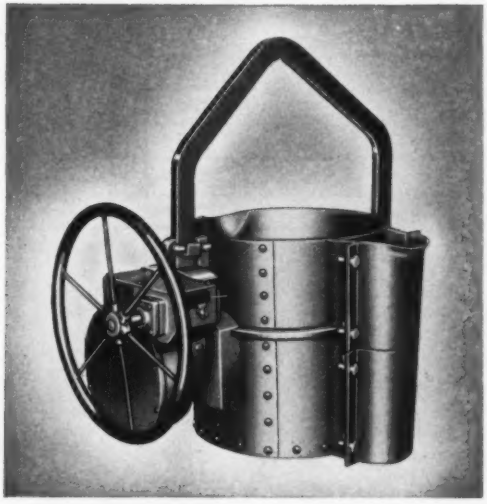

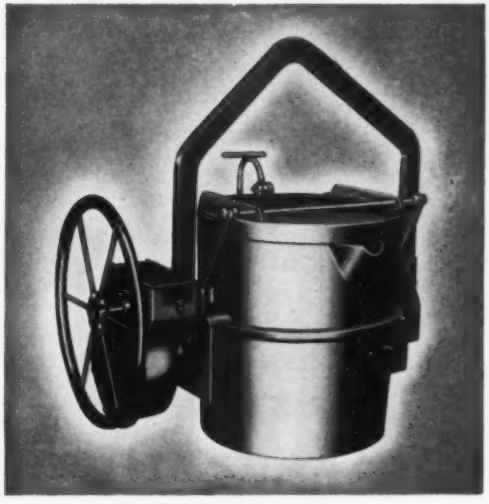

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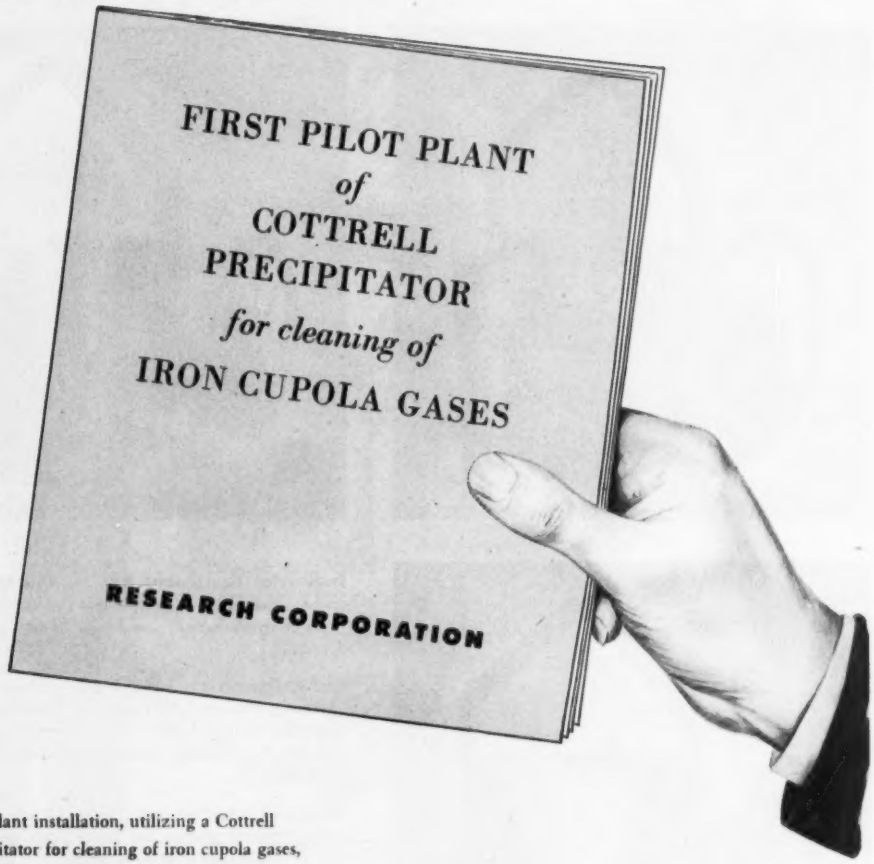
News on a New Process



The first pilot plant installation, utilizing a Cottrell Electrical Precipitator for cleaning of iron cupola gases, had resulted in detailed findings of industry-wide importance. On the basis of facts unearthed about cupola operation and the study of the design factors involved in this project, foundries have already placed orders for 15 precipitators with Research Corporation.

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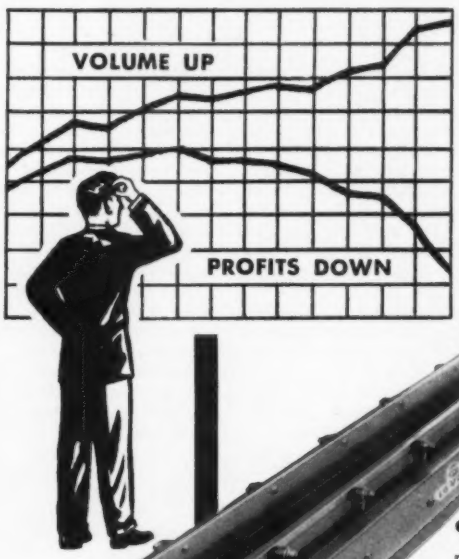

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WESTFIELD, NEW YORK

A Society-wide survey of A.F.S.

Chapter educational activities

GEORGE J. BARKER / *Chairman, A.F.S. Educational Division*

A.F.S. Educational Division, the Society's newest, has been afflicted by growing pains, mostly mental and suffered by its officers, who have not been completely satisfied with the Division's accomplishments, particularly in relation to chapter educational work. With this in mind, the Division sent out a questionnaire requesting a report on local activities. Here are some conclusions drawn from the replies.

■ At a recent meeting of the Educational Division Executive Committee, a motion was passed authorizing the secretary to send a questionnaire to each of the 40 A.F.S. chapters on their educational programs. Of the 40 chapters, 26 replied that they have appointed educational committees. They are: Birmingham District, Canton District, Central Illinois, Central Indiana, Central Michigan, Central Ohio, Chicago, Eastern Canada, Eastern New York, Michiana.

Northeastern Ohio, Northern Illinois-Southern Wisconsin, Northwestern Pennsylvania, Ontario, Oregon, Philadelphia, Quad City, Saginaw Valley, St. Louis District, Southern California, Tennessee, Texas, Timberline, Western Michigan, Western New York and Wisconsin.

No replies were received from 14 chapters and it is assumed they have little or no interest in education.

Varied activities

Activities of local committees vary widely and there appears to be no common objective. This survey indicates that there is considerable doubt as to activities to undertake.

Attempting to classify the activities of the committees as reported, it was found that six were contacting high schools in an effort to attract students into the industry upon graduation. Some of these used lectures and talks about the industry and others presented movies. It is very difficult to evaluate the results secured by these efforts because of the vagueness of the answers given to the questionnaire.

Three committees made sponsoring of the Apprentice Contest their main objective. One was active in supplying a textbook to a technical school library. Two cooperated with technical high schools by sending plant men to talk to the classes. Two are assisting student A.F.S. chapters in their meetings. Two are helping universities affiliated with the Foundry Educational Foundation. One is helping to equip the foundry laboratory in a local high school. Five are promoting various types of classes for the general membership, such as a sand school, etc. And five of the committees have had no meetings to formulate their ideas of the work they should undertake.

Needed: cooperation

The general impression received from questionnaires is that there is little or no cooperative effort between the educational committees of the local chapters and the national educational division. There appears to be a general desire on the part of chapters to attract high-school students into the foundry industry as workers. There also appears to be a desire to advertise the foundry industry so that more people are aware of such an industry. The main effort put forth by the local chapters seems to be to work with the local high and technical schools in an endeavor to secure foundry help. This effort is very commendable and should be enlarged upon.

The Saginaw Valley Chapter appears to have this phase of the work very well organized, holding one meeting every week during March for high school students.

The chapter furnishes bus transportation for the students from nearby cities and puts on a program based on the high school level. Reports indicate that response has been excellent and many boys enter the foundry industry because of this program.

The next best organized plan appears to be the sponsoring of the Apprentice Contest. The national contest is very well organized but does need considerably more help and cooperation from the local chapters. Each educational committee could further the interest of the young plant worker by giving more assistance to the program.

Only a few of the chapters appear to be doing anything at college or university level. This is probably because few chapters have close enough contact with universities. The present Foundry Educational Foundation program should give more than half the chapters an opportunity for closer educational work at a higher level. The local chapters should not depend upon F.E.F. to carry on its program alone.

The Educational Division of A.F.S. has carried out some beneficial programs for the industry. One of these is the publication this year of a textbook at high school level. Plans are underway for the publication of a textbook at college level, and a third book may be published which can be used by the technical schools. It also has nine committees, each attempting to carry out its particular function. It is apparent there is no close tie-in of the local chapters with the national division. If either of these is to be more successful in its work, there should be a very close coordination between them.

Under the leadership of A.F.S. National Director Fred G. Sefing, chairman of the committee on "Guide to A.F.S. Chapters on Educational Activities," machinery is already established for this desired closer relationship. The problem which now confronts us is to find a way to set this machinery in motion and keep it properly oiled so it will function properly. There is certainly sufficient talent in the organization to do this, and concrete results will be seen in the near future.

Three-dimensional model of new Fairbanks, Morse foundry exhibited May 1 to 8 at Booth No. 1524, AFS Convention, Atlantic City.

Viewing it are Lester B. Knight, President; L. E. Everett, Vice President; and H. W. Maxon, Manager, Construction Engineering Division of Lester B. Knight & Associates, Inc.

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From production rigging through organization, manning, production control, production standards, equipment, buildings, personnel and service facilities—Knight engineers are working with the Fairbanks, Morse staff to develop the simplest layout for lowest cost.

Then Knight will supervise the construction and installation—and turn the plant over to the client—ready to run. *This modern foundry will be a good place to work.*

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Letters to the editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

About the "new look"

■ Congratulations on the excellence of the pre-Convention issue of AMERICAN FOUNDRYMAN. It is a beautiful job and a tribute to the important part played by the foundry industry.

D. H. WORKMAN
Executive Vice-President
Gray Iron Founders' Society

■ Have just read my March copy of AMERICAN FOUNDRYMAN, and I wish to congratulate the staff on such a fine job and upon the new style. It is easy to read and holds one's attention throughout, and looks like I feel when I am dressed up in a new outfit. I do not know of any other technical magazine that can equal it in style and attractiveness.

E. J. MCAFEE,
Master Patternmaker
Puget Sound Naval Shipyard
Bremerton, Wash.

■ I want to commend someone for an outstanding job in magazine advertising and much improved article readability. Members of A.F.S. and subscribers should be proud of their magazine.

E. H. BALLARD, *Retired*
General Electric Co.

■ Congratulations on the "new look" of AMERICAN FOUNDRYMAN. It presents a very pleasing appearance and is extremely readable.

WILLIAM A. SNYDER, *Asst. Prof.*
University of Washington
Seattle, Wash.

■ The "new look" is OK! Your choice of the three column make-up is especially good. Thanks for making the change. We express our appreciation for fine work on the magazine.

F. E. FOGG, *Vice-President*
Acme Foundry & Machine Co.
Coffeyville, Kan.

Believes industry lazy

■ I have read and reread I. R. Wagner's editorial in the December 1951 issue of AMERICAN FOUNDRYMAN. He impresses me very much. He says "the foundry industry is lazy in its training." I concur heartily. Every foundry wants the other shops to train workers so they can hire them after being trained.

It has long been my feeling that the foundry industry is missing a bet in not encouraging promising young men already in foundries to go on to college to receive engineering fundamentals or even to develop scholarships for them just as Mr. Wagner pointed out.

The same thing can be done in foundry centers by means of specialized extension courses in foundry engineering in the evenings for employees who are interested or who could be interested. One or two years of such a program would do much towards raising the quantity and quality of technical information utilized in foundries.

We must remember that while we install a fine roof to eliminate the leaks, we also need to strengthen the foundations of our houses. Without a good supply of the basic worker, the properly trained molder, the industry will not be able to keep the prominence and place of importance that it boasts today.

M. C. SANDES
Foundry Training Coordinator
Mare Island Naval Shipyard
Vallejo, Calif.

Nuclei question not settled

■ Publication of my paper *"Nodules and Nuclei in Nodular Iron"* (AMERICAN FOUNDRYMAN, February, p. 44) may in some quarters, lead to erroneous impressions and so I would like to clarify my present position on the subject.

At the moment, I am definitely not convinced one way or the other as to whether nodule formation in nodular cast iron is due to a specific nucleus. It is a very difficult subject for experimentation since the matters dealt with are extremely minute, and the use of experimental techniques dealing with quenching of irons from the liquid or semi-liquid state suffer the disadvantages that have been recognized for years in the quenching of gray cast irons in order to elucidate processes of flake formation.

With respect to the "central spot" or possible "nucleus" that one sees frequently in spherulitic graphite nodules, it is easily shown that this "spot" can be entirely explained by considerations of the pattern of crystallization of graphite within the nodule, i.e., the "central spot" being a basal plane that peels off. This, however, while explaining the presence of the "spot", does not furnish conclusive proof as to whether or not there is a specific nucleus.

Furthermore, recent work in these laboratories has shown that there is definitely iron within the nodule and its location has been determined. However, while this explains the magnetism of nodular graphite, it again furnishes no proof of the presence or absence of a specific nucleus. Details of these latter experiments will be published in the near future.

For the above and similar reasons, I cannot consider that the question of whether there is or is not a specific nucleus has been answered, or indeed that there is yet any adequate explanation of the origin and growth of spherulitic graphite nodules.

J. E. REHDER, *Foundry Engineer*
Dept. of Mines & Technical Surveys
Ottawa, Ont., Canada

Putting on a demonstration of shell molding during an open house in Brooklyn Polytechnic Institute's foundry were these A.F.S. Student Chapter members and instructors, left to right: John Neesham, Frank Kimpel, Instructor Warren O'Neill, Louis Honig, Richard Casagrande, Jerome Sadofsky, Peter C. Paranicas, Emil Rogner and Gerald Bennett.

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Delta Special Core & Mold Wash Base — Used by more steel foundries than all other types of washes combined.

Delta SteelKoat — a finished high fusion waterproof wash.

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PARTING COMPOUNDS:

Delta Partex — (Nutshell partings) has lycopodium properties, non-injurious and non-hazardous to use.

Delta Liquid Parting — Low-cost, highly effective and lasting.

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A special compound, not iron oxide. A high hot strength and sand plasticizing material. Stops veins and penetration.

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Delta Spray Binders — Produce dry sand mold results by surface spraying of green sand molds.

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Eliminates Sea Coal Nuisance: The new modern scientific sea coal replacement.

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A new type of Dry Binder which provides new economies. Fast-baking, reduces veining and penetration. Can be used with old sand equally as well as with new sand.

BONDITE: Produces a reducing mold atmosphere:

For Steel and Gray Iron — Use Delta Bondite, a dry binder which becomes waterproof on drying and produces mold atmosphere which is high in reducing gas.

96-B SAND RELEASE AGENT:

Another Foundry *"First"* by Delta. By adding 8 oz. or less per ton to your core or molding sand mixes, your sands will flow freely. 96-B is completely volatile at elevated temperatures and does not contaminate the sand.

CORE ROD DIP OIL NO. 224X:

Ties core rods and wires into the cores:
Rods and wires coated with Delta Core Rod Dip Oil adhere to the sand. Eliminates need for 50% of the rods and wires and reduces core breakage.

DELTA SAND CONDITIONING OIL:

Sticking core sand mixes work freely in core boxes when sand conditioning oil is added to core sand mixers.

CORE OILS:

High tensile, low gas, faster baking, exceptionally economical to use.

Get the Facts...

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

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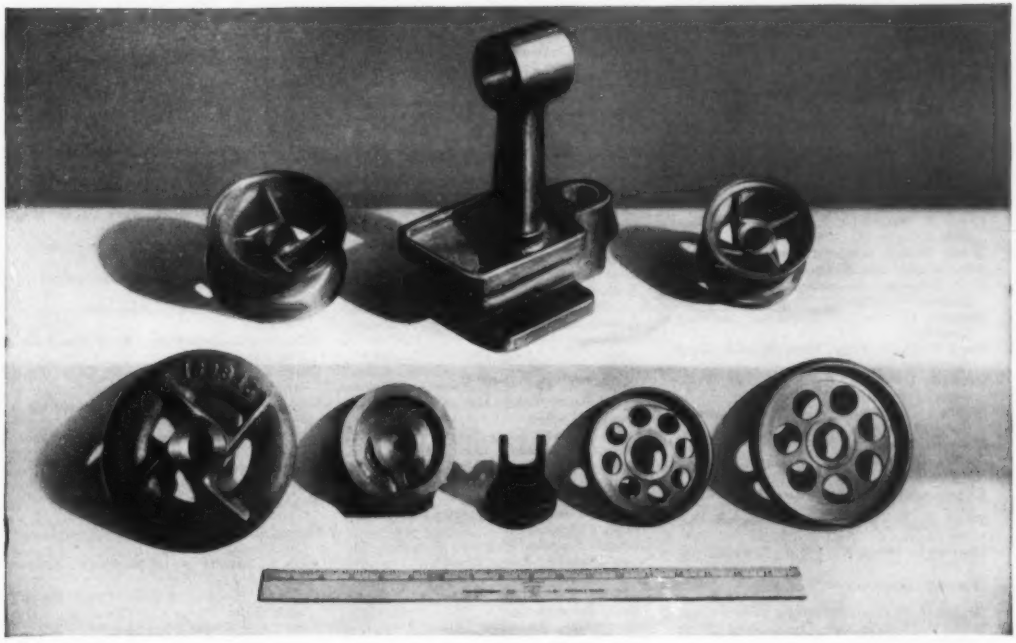
NISILOY*

to eliminate hard chilled areas in gray iron castings

. . . REDUCE machining time, tool wear, rejections



Produce *machinable* gray iron castings regardless of sharp variations in section thickness . . .

Eliminate localized hard areas or chilled (white) edges and surfaces . . .

Reduce machining time, tool wear and rejections . . . *raise both quality and quantity of your output by controlling gray iron structure with small ladle additions of NISILOY.*

Designed specifically to promote better machinability, NISILOY is a powerful innoculant and graphitizer containing about 60% Nickel, 30% silicon, balance essentially iron.

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AFS Introduces

continued from page 110

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A hit of the Foundry Congress...

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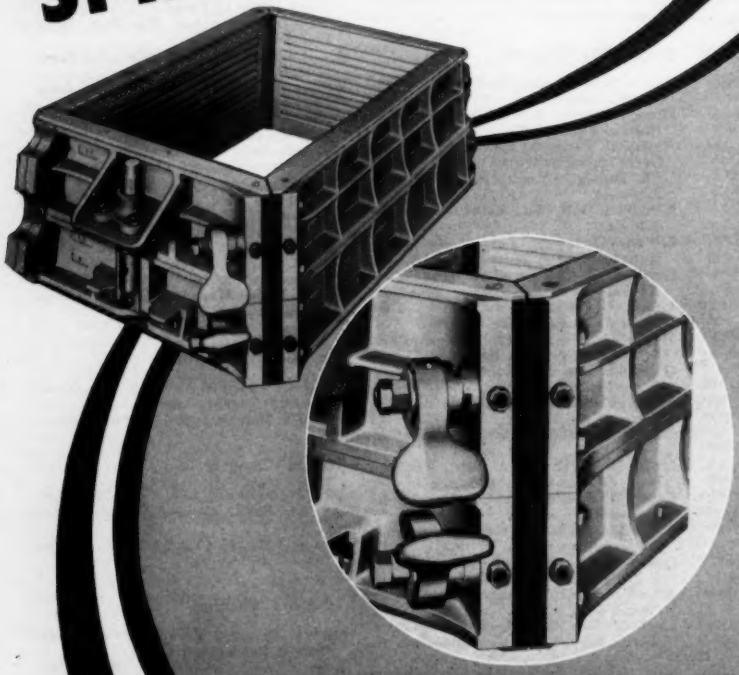

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This great development in flasks also embodies all the many advantages of Fremont's popular standard magnesium slip flasks, being lighter in weight, thus easier to handle and assuring longer service, more exacting work.

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chapternews

Surrounding the pretty accordionist at Chicago Chapter's April meeting were members of a visiting foundry productivity team from Austria. Since most of its members do not speak English, the team carried its own interpreters and interphone system.

Brooklyn Polytechnic Institute

EMIL ROGNER
Chapter President

Newly formed Student Chapter here made the first of several proposed field trips April 15 to American Brake Shoe Co., Mahwah, N. J. Almost the entire membership attended the 1952 A.F.S. International Foundry Congress & Show in Atlantic City on Sunday, May 4.

Bernard N. Ames, New York Naval Shipyard, Brooklyn, spoke at the March meeting on "*Shell Molding.*"

Mr. Ames traced the history of shell molding, beginning with its origin in Germany, and told of the difficulties with the process that were encountered by research men at the New York Naval Shipyard. Mr. Ames went on to explain just how the process works.

Texas

ROBERT C. HARRELL
Lone Star Steel Co.
ISRAEL SMITH
Western Foundry Co.

East Texas Section of the Texas Chapter held its first meeting in January at Marshall, Texas, with 93 foundrymen attending. Second meeting was a visit to Lone Star Steel Co., Lone Star, Texas, and co-featured a dinner meeting attended by 136 Texas founders.

Third meeting was held March 14 at Tyler, Texas, with 135 present. It is planned to rotate meetings between Marshall, Lone Star, Tyler and Longview, Texas, and Shreveport, La.

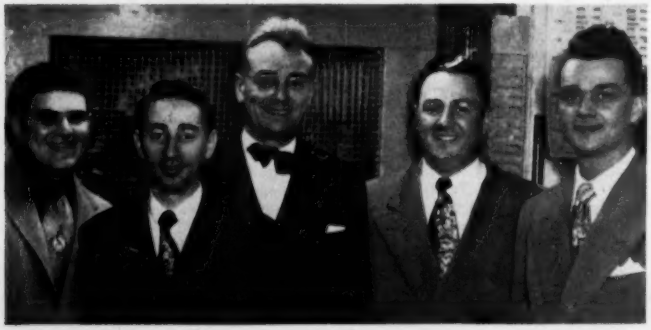
Carrying out the work of the East Texas Section of the American Foundrymen's Society Texas chapter are:

Chairman Robert Harrell, Lone Star Steel Co.; Secretary Robert K. Hoague, Lone Star Steel Co.; Paul Martin, Brewster Co.; Joseph Nettles, Mid-Continent Steel Casting Co.; R. E. Smith, Sollberger Engineering Co.; William Speas, Tyler Pipe & Foundry Co.; Russell McBride, McBride Pattern Works.

continued on following page

Navy gold braid was very much in evidence, as were prominent Atlantic Seaboard foundrymen, at Philadelphia Chapter's Fourth Annual Management Night. Seated at the speakers' table under Franklin Institute's famed statue of its founder were, left to right: Captain Weaver, USN; A.F.S. National Director Frederick G. Selfing, International Nickel Co., New York; Captain Lambert USN; A.F.S. National Director E. C. Troy, Palmyra, N. J.; Admiral Botta, USN; A.F.S. President-Elect I. R. Wagner; Chapter Chairman G. H. Bradshaw, Philadelphia Naval Shipyard; Admiral Watt, USN; Admiral Kniskern, USN, commander, Philadelphia Naval Shipyard; A.F.S. Secretary-Treasurer Wm. W. Maloney and Philadelphia Naval Base's chaplain, Lieut. E. J. Northling.

Alex Hubbard, cupola supervisor, (extreme right) shows completed molds to students and instructors of Arthur Hill Trade School, Saginaw, Mich., during a tour of the Vassar Foundry Division of Eaton Manufacturing Co., Vassar, Mich., held in conjunction with Saginaw Valley Chapter's annual Chapter Education Series on March 20. Photograph courtesy of John Fraker, Eaton Manfuacturing Co., Foundry Division, Vassar, Mich.



Pictured here are officers and faculty advisors of the newly formed A.F.S. Student Chapter at Brooklyn Polytechnic Institute. From left are: Chapter Vice-President Jerome Sadofsky; Treasurer Louis Honig; Faculty Advisor Wm. A. Ruten; Instructor Warren O'Neill, assistant faculty advisor; and Chapter President Emil Rognér.

A group of visiting high school students look on as castings are removed from permanent molds at Eaton Manufacturing Co.'s Foundry Division, Vassar, Mich., during a plant tour held in conjunction with Saginaw Valley Chapter's Educational Series, March 20. Photograph courtesy John Fraker, Eaton Manufacturing Co., Foundry Division.

Northwestern University

WILLIS CHANDLER
Assistant Professor
Chemical Engineering Department

Student Chapter members operated Northwestern Technological Institute's foundry during an open house held on March 6. Students explained and operated foundry equipment, made and poured molds, and made four melts, three of aluminum in a gas-fired crucible furnace, and one of gray iron in a rotating arc furnace. Some shell molds were shown and equipment for their production displayed.

Northwestern Pennsylvania

ROY A. LODER
Erie Malleable Iron Co.

Chairman Douglas James, Cooper-Bessemer Corp., opened the March 24 meeting with a brief business session, then turned the meeting over to the Entertainment Committee for a showing of the sound film, "*Dust and Fume Control.*"

Speaker of the evening Thomas E. Barlow, Eastern Clay Products Dept., International Mineral & Chemical Corp., said that the highest-priced refractories do not always make the best cupola lining, nor are the cheapest refractories most economical in the long run. If the foundry skimps on refractory quality, it may start out with a 42-in. diameter cupola in the morning and wind up with a 60-in. cupola at the end of the day.

By using a straight sidewall, Mr. Barlow said patching comes off, causing the coke bed to drop and produce cold iron. If an oval shape or pot belly is used, he said, walls will not burn out as fast.

Chicago

DEAN VAN ORDER
Burnside Steel Foundry Co.

More than 170 Foundrymen attended the April meeting to hear Werner B. Bishop, Archer-Daniels-Midland Co., who preceded his talk with a film called, "*The A-D-M of Cores*".

The film emphasized many problems encountered in mixing and baking core sands. After showing the film, Mr. Bishop answered questions from the floor dealing with core problems.

He said that plastic or resin binders are the fastest baking but will stick more in the core boxes and are more expensive. A new film will be out in a year which will deal with baking cores at high temperatures, he said.

Mr. Bishop closed his talk with three factors which he considers important: (1) better control over ingredients in sand mixes, both in the foundry and core room, (2) proper sequence of additions and mixing must be followed, and (3) proper moisture is very impor-

tant; 1 per cent of moisture can vary the strength as much as 50 per cent.

The Chicago Chapter was honored at the April meeting by the attendance of an Austrian productivity team. Although the majority of the group did not understand English, its members were kept informed of all conversation by an interpreter and interphone communication.

Central Indiana

PAUL V. FAULK
Electric Steel Castings Co.

A.F.S. Past National President H. Bornstein, Deere & Co., Moline, Ill., was featured speaker at the chapter's April 7 meeting in Indianapolis.

Discussing "*Ferrous Metallurgy and Foundry Practice*," Mr. Bornstein began by telling how tensile strength of cast iron in World War I was around 28,000 psi. Today, it is from 65,000 to 85,000 psi, he said, due to more efficient use of alloys and use of mixing ladles.

Mr. Bornstein also explained that there had been some over-selling on the part of the industry for high strength irons. He related some experiences during World War II. Many designing engineers thought that if 35,000 psi iron was good, 65,000 was better and that was what they specified. In the interest of alloy conservation, the thinking of these engineers had to be changed and an educational program was started. Up to the present, this seems to have done the job. Mr. Bornstein brought out the uses and advantages of nodular iron and stated that in his opinion it would never take the place of malleable iron as some people were advocating.

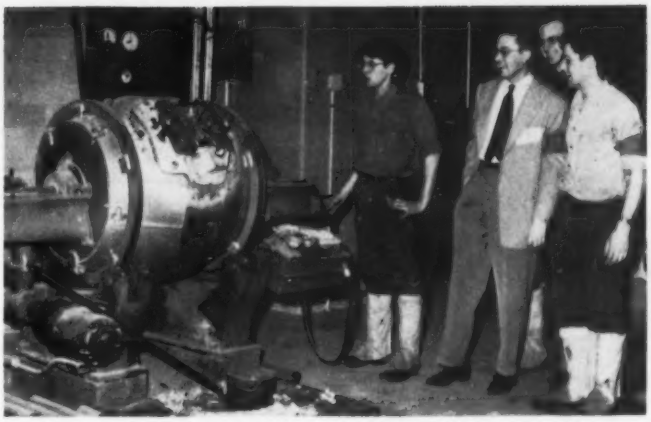
MIT

G. D. CHANDLEY
Chapter President

March 20 meeting had some 22 members present for election of the following officers: President, G. D. Chandley; Vice-President, R. F. Harris; Secretary-Treasurer R. E. Simmons; and Technical Secretary, R. A. Chihoski.

The group may begin publication of an M.I.T. *Alumni Newsletter* in future. It was recently started by Ron Greene and Prof. H. F. Taylor. Its new editor is Bob Greene.

Principal speaker was F. H. Norton, professor of ceramics at M.I.T., who spoke about "*Clays—Their Chemistry and Bonding Action.*" Some very interesting points of his lecture were: (1) clays, contrary to older ideas are crystaline substances, (2) bentonite clay is made up of aluminum and silicon oxide layers bonded together by weak Van der Waals forces, (3) fine clays have a much greater bonding action than coarser clays, (4) in drying pure clays, loss of volume equals volume loss of water, (5) wet and dry bonding actions of pure clays are different—when wet,



Feature of Northwestern Technological Institute's March 6 open house was operation of the school foundry by members of the Northwestern University Student Chapter. Overseeing a gray iron melt in a rotating arc furnace are, left to right: Student John Byrnes, Professor Willis Chandler and Students Joe Albens and Putt Volkman. Photograph courtesy of Dean Van Order, Burnside Steel Foundry Company, Chicago.

Photographed by A. J. Rumely, Jr., LaPorte Foundry Co., during Michiana Chapter's recent Sand School were Al Lauer, Weil-McLain Co., and Frank S. Brewster, Harry W. Dietert Co., Detroit, who conducted the school. Approximately 85 foundrymen attended.

Discussing Southern California Chapter's March meeting program just before the session opened were, from left: Harold Pagenkopp, Angelus Pattern Works; speaker Hiram Brown, Solar Aircraft Co., Des Moines; and Chapter President Harry Howell, Howell Foundry Co.

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Why 3 Per Cent Chrome Steel Makes Good Castings for Wear Resistance

Castings of 3 per cent chromium steel have been used in substantial tonnages, for many years, for various equipment parts demanding good wear resistance. Such castings offer an excellent combination of hardness and toughness. Typical applications are crusher parts used in rock- and ore-crushing equipment, swing hammers for pulverizing coal, railroad switch frogs, gears, pulleys, sheaves, and other castings that must meet severe conditions of wear.

Fig. 1. Railroad switch frogs, which are subject to severe wear, give outstanding service when cast of 3 per cent chromium steel.

The 3 per cent chromium steels, are normally produced in a carbon range of 0.30 to 0.50 per cent. They exhibit excellent depth-hardening properties, which simplify heat-treatment and insure uniformity throughout heavy sections. The analysis is usually modified by a molybdenum addition, since this element aids in increasing hardenability.

Fig. 2. Grating for top of shake-out machine is cast of 3 per cent chromium steel to give good wear resistance and long life.

Properties Improved by Heat-Treatment

The best properties of 3 per cent chromium steels are developed through heat-treatment. Generally, this consists of a normalizing treatment from 1650 deg. F., followed by tempering in a range between 1000 and 1250 deg. F., depending on the physical properties desired. Double normalizing is sometimes used to obtain further improvement in the grain structure. With carbon on the high side of the specification, air-quenched castings show a Brinell hardness number of over 400 in 3-inch sections. This hardness is practically uniform throughout the section. Oil quenching is employed to produce higher hardness and depth of penetration, and even in a 4-inch section, a hardness number of over 500 Brinell is obtained.

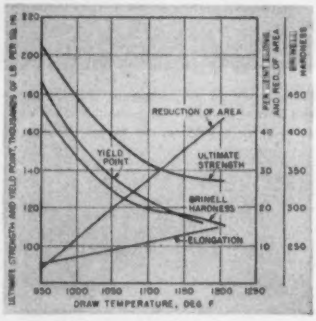


Fig. 3. These curves show the response to tempering of a 0.37 per cent carbon, 2.93 per cent chromium, 0.35 per cent molybdenum steel previously normalized from 1650 deg. F.

The steel also shows good response to tempering. After a normalize and a 1100 deg. F. treatment, it has a tensile strength close to 150,000 pounds per square inch, with an elongation value of about 12 per cent, and a Brinell hardness of about 300. When greater ductility is required, tempering should be done at higher temperatures. However, in such instances, some strength and hardness are sacrificed.

Fig. 4. Photomicrograph of 3 per cent chromium steel normalized from 1650 deg. F. and tempered at 100 deg. F. (X250). The pseudo-martensitic structure is well suited to resist abrasion.

Effect of Other Alloy Additions

Molybdenum in the range from 0.30 to 0.50 per cent will improve depth-hardening characteristics and aid in reducing susceptibility to temper brittleness in the lower temperature ranges. If the molybdenum-bearing steel contains relatively high carbon (0.40 to 0.60 per cent) additions of approximately 0.08 to 0.10 per cent vanadium provide greater uniformity in hardening. Small additions of silicon increase strength and hardness and this element is sometimes increased to 0.80 or 1.00 per cent. Manganese is added in amounts between 0.50 and 0.80 per cent.

Metallurgical Service Available

When you have occasion to produce castings for applications involving severe abrasion and wear, it will pay you to investigate the advantages of using 3 per cent chromium steel. If you need help on some specific metallurgical problem, be sure to consult one of ELECTROMET's specially trained metallurgists and engineers. For further information, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

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the clays are bound together by capillary action, like two glass plates with a thin layer of water between them. Upon drying, clay assumes a definite crystalline pattern—thus reaching dry strengths of 1000 psi.

Oregon

NORMAN E. HALL
Electric Steel Foundry Co.

Featured at the February 13 Meeting at the Heathman Hotel was a talk by Clyde A. Sanders, American Colloid Co., Chicago, on "*Foundry Sand.*"

Using slides and movies to illustrate his talk, Mr. Sanders reviewed some of the sand research projects in which he has taken an active part. Research on iron has been completed and the program on steel is now in progress, he said.

Mr. Sanders also described the influence of molding sands on shrink and the effects of additions of moisture, southern and western bentonite, and sea coal to the same base sand.

Charles Utterback, chairman of the A.F.S. Student Chapter at Oregon State College, invited the membership to a meeting to be held at the college in Corvallis on May 25. L. E. Bason, National Carbon Co., a Division of Union Carbide & Carbon Corp., has taken over as membership chairman for the balance of the year, replacing Norman Rupp, Carborundum Co., who has been transferred to the San Francisco area. Norm has done a swell job and we wish him the best of luck in his new position.

Tablemates at Wisconsin Chapter's "Management Night," March 14 were, from left: Raymond Thiesen, Krause Milling Co.; Herbert L. Klopf, General Foundries; and Walter Gerlinger of Walter Gerlinger, Inc. Photo courtesy W. V. Napp, Delta Oil Products Co., Milwaukee.

Discussing foundry sand problems just prior to Oregon Chapter's February meeting were Chapter Vice-Chairman William Halverson, left, Electric Steel Foundry Co., Portland, and February meeting speaker Clyde A. Sanders, American Colloid Co., Chicago. Photograph courtesy of Norman E. Hall, Electric Steel Foundry Co., Portland.

Washington

HAROLD R. WOLFER
Puget Sound Naval Shipyard

February meeting, held at the Frye Hotel, Seattle, featured a talk on "*Foundry Sands*" by Clyde A. Sanders, of the American Colloid Co., Chicago.

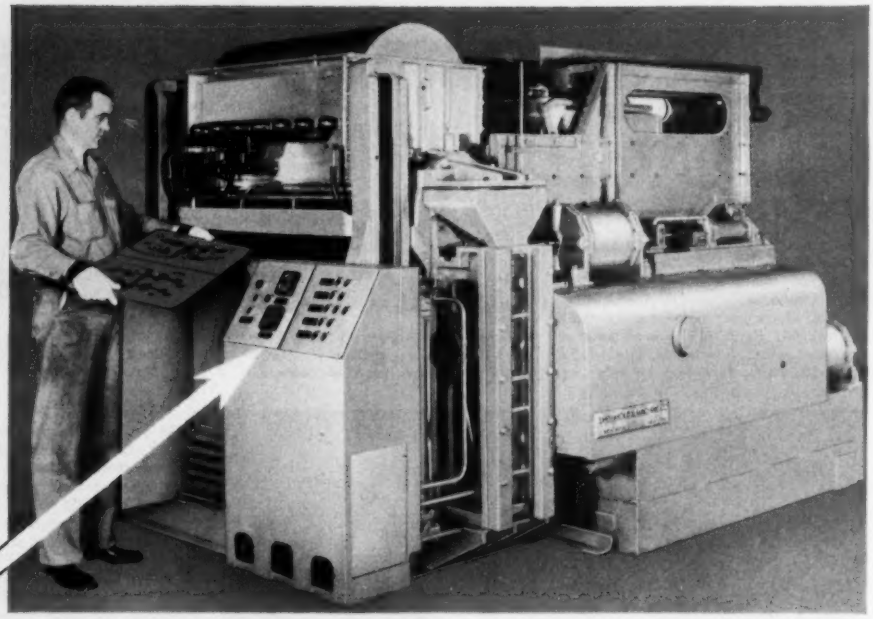
Mr. Sanders illustrated his talk with slides showing influence of molding sand binders on castings shrinkage.

In a recent research project on iron castings, in which all variables of sand mixtures were accurately controlled, Mr. Sanders reported shrinkage due to sand was closely linked with the type of binder used. Sands with high flowability having carbon addition (seacoal) produced the least shrink in the test castings, while gummy sands with high moisture content produced the greatest shrink, he said.

Sands bonded with western bentonite produced considerable shrink in the test casting. Fireclay as a bond produced the greatest piping while mixes containing southern bentonite, wood flour and seacoal produced the least amount of piping. Water, with its bulking effect, as high as 30 per cent for the higher moisture contents, caused piping even in the mixes bonded with southern

A.F.S. Past National President H. Bornstein, Deere & Co., Moline, Ill., left, discusses some fine points in the art of casting metals with William Zeunik, National Malleable & Steel Castings Co., Indianapolis, at Central Indiana Chapter's April 7 meeting. Photograph courtesy Henry O. Yeager, International Harvester Co., Indianapolis.

TYPE SU-1 SHELLMOLD UNIT



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bentonite. The southern bentonite mix produced a harder mold with less ramming energy because of its greater flowability and because its lower bond strength offers less resistance to the ramming force, thus giving good rammed density to resist straining in the mold—a contributing cause of shrinks due to sand.

Mr. Sanders stressed the importance of knowing how hard the sand is rammed because regardless of type of binder used only correct ramming will produce the desired rammed density.

Talking foundry shop just prior to Twin City Chapter's March meeting were, left to right: Prof. O. W. Potter, University of Minnesota; Paul and Leo Brom, Brom Foundry, Winona, Minn.; and Herbert Blasjo, Minneapolis Electric Steel Co., Minneapolis.

Rochester

HERBERT G. STELLWAGEN
Hetzler Foundries, Inc.

April 1 meeting was preceded by a chapter directors' meeting in which membership progress was discussed and the nominating committee made its recommendations for 1952-53 chapter officers and directors.

At the regular meeting, Program Chairman Leon Kimpal presented speaker Donald LaVelle, Federated Metals Div., American Smelting & Refining Co., who spoke on *"Aluminum Casting Defects and Their Correction."*

With picture slides, Mr. LaVelle conducted an informal talk, requesting members to interrupt him at will.

Mr. LaVelle said that aluminum is an easy metal to handle and that if trouble is corrected when first seen, considerable time will be saved in the production of aluminum castings. The most serious fault in the handling of metal comes in pouring and handling of molten metal.

The metal should not be puddled in the crucible for good results, but should be sparingly stirred, he said, and should be poured into a clean mold with as little turbulence as possible.

At all times, a skin of metal from the lip of the crucible to the mold should be maintained, making it possible for the molten metal to pass into the mold with minimum of oxidation. This prevents air from striking the molten metal; prevents oxidation and if the sprue is kept filled, helps to eliminate hard spots and holes in the castings, Mr. LaVelle said.

When melting in iron pots, he said, it is best to coat the pot to keep the iron from coming in contact with the metal. Nitrogen fluxing is beneficial but must be handled properly. To produce good castings, care must also be given to the sand to see that there are no clay balls for the metal to contact, he concluded.

Walter E. Sicha, Aluminum Co. of America, Cleveland, speaking on aluminum casting practice at the March 14 meeting of Central New York Chapter.

Canton District

WILLIAM T. COLE
Canton Malleable Iron Co.

Last monthly meeting of the current year was held April 3 at the Mergus Restaurant, Canton, with Ben Taylor speaking on *"Today's Challenge in Human Relations"* before an audience of 73.

Chapter Chairman C. B. Williams, Massillon Steel Castings Co., presided, with Alexander O. Prentice, Stark Foundry Co., as technical chairman for the meeting.

Heading up the program at Central Michigan Chapter's March 19 dinner meeting were, from left: Chapter Chairman Thomas T. Lloyd, Albion Malleable Iron Co.; A.F.S. National Director Harry W. Dietert, Harry W. Dietert Co.; speaker C. T. Greenidge, Battelle Memorial Institute, Columbus, Ohio; and Prof. C. C. Sigerfoos, Michigan State College.

Eastern Canada

A. E. CARTWRIGHT
Crane, Ltd.

"Modern Trends in Foundry Practice" was the topic of speaker Howard F. Taylor, Massachusetts Institute of Technology, at the March 14 meeting.

Mr. Taylor said that progress in cast iron metallurgy is hampered by lack of fundamental study of the physical chemistry of cast iron. There is much greater understanding of the physical chemistry of steel, he said.

Mr. Taylor predicted improvements in cupola melting of cast iron by (1) hot blast, (2) closed pressure stacks, and (3) basic linings, which are now reduced in cost to a point where comparative economy with acid refractories is within sight.

Still greater understanding of sand and bonding agents is required, Mr. Taylor asserted, to produce improve-

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ment in casting quality and the shell mold process is a new technique embodying the nearest approach to ideal molding practice—allowing sand grains to find their most effective arrangement against the pattern in dry state, followed by bonding together with molten plastic.

He referred also to improved cleaning room practices made possible by constant study and improvement of grinding wheels, to flame cutting methods and to highly-maneuverable band saws.

Many other modern trends were dealt with by the speaker, who quite evidently was limited only by the time at his disposal. A number of questions put forward by the audience brought further interesting discourse by Mr. Taylor.

The meeting was under the chairmanship of Chairman W. Turney Shute. Henry Louette introduced Mr. Taylor and acted as technical chairman. G. E. Tait thanked Mr. Taylor on behalf of the Chapter for his greatly appreciated lecture.

Eastern New York

KENNETH F. ECHARD
Eddy Valve Co.

March 18 meeting opened with a talk by A.F.S. National Director Lloyd D. Wright, U. S. Radiator Corp., Geneva, N. Y., who brought the chapter up to date on the 1952 International Foundry Congress, how to conduct a chapter meeting, and on the status of the proposed new A.F.S. Headquarters.

Meeting speaker C. A. Robeck, Gibson & Kirk Co., Baltimore, Md., discussed "*Non-Ferrous Foundry Practice*," in which he detailed basic requirements for (1) melting—with emphasis on keeping records, (2) molding—pattern information and sand behavior, (3) coremaking—accurate measurement of ingredients, and (4) cleaning room cooperation in correcting defects.

Mr. Robeck also told of the proposed A.F.S. Standard Test Bar Procedure for 85-5-5-5 Bronzes.

Photographed during the March meeting of the Central New York Chapter were, left to right: Edward Cahill, Aluminum Co. of America; A.F.S. National Director Lloyd D. Wright, United States Radiator Co.; Chapter Chairman William D. Dunn, Oberdorfer Foundries, Inc.; and meeting speaker Walter E. Sicha, Aluminum Co. of America, Cleveland.

Getting some tips on foundry education from Charles Esgar, staff assistant, Foundry Educational Foundation, at Missouri School of Mines Student Chapter's April meeting were, from left, FEF Scholarship Students Jack H. Thompson, Reinhard Abendroth, Jack Wheeler.

Tri-State

J. G. WINGET
Reda Pump Co.

Guest speaker at the March 14 meeting was Al Zima, International Nickel Co., who discussed "*Steel Castings.*" Mr. Zima's talk was essentially a comparison of engineering properties between steel castings and steel forgings or weldments. Mr. Zima used a number of slides to show that properties of steel castings and steel weldments are similar.

The meeting was designated "National Directors' Night" and the chapter had as its guest for the second successive year A.F.S. National Director L. C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill., who participated in a chapter directors' meeting before the regular meeting.

Also attending were a number of students taking foundry courses under the auspices of the chapter's educational division.

Southern California

ALFRED A. GRANT
Grant & Co.

March 14 meeting speaker was Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, chairman of the A.F.S. Aluminum & Magnesium Division, who spoke on "*Light Alloy Foundry Practice.*"

Mr. Brown pointed out that good foundry practice does not begin with the melting operation, rather, it starts with selection of pots and furnaces for quality and economy.

Various types of melting equipment were then discussed. In general, Mr. Brown said the lift-out type of furnace, using a crucible is excellent in that heat is conserved, helping to prevent dross and gas from forming.

Since many aluminum alloys tend to dissolve steel pots, Mr. Brown recommended that either clay-graphite or silicon carbide crucibles be used for melting. If iron crucibles are to be used, he said, care must be taken that they

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A.F.S. President-Elect I. R. Wagner speaking at Toledo Chapter's "International Night," held February 13 at the Toledo Yacht Club. Looking on, from left, are: Victor E. Zang, J. L. Tillman and John Mescher, all of Unitcast Corporation, Toledo.

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AFS Introduces

continued from page 113

Twin City Chapter

Roman Filipovich, Lab. Asst., *American Hoist & Derrick Co.*
Louis M. Fleming, Jr., Lubrication Engr., *Cities Service Oil Co.*
Donald Grilz, Owner, *Pier Foundry.*

Washington Chapter

Myron D. Stepath, Pres., *Arcair Co.*

Western Michigan Chapter

Austin E. Anderson, Fmn., Clover Foundry Div., *Hastings Mfg. Co.*
George W. Bartlett, *Lakey Foundry & Machine Co.*
John H. Bodine, Indus. Salesman, *Muskegon Hardware & Supply Co.*
Stanford A. Broutman, Purchasing Agent, *Paul M. Wiener Co.*
D. G. Denison, Jr., Secy-Treas., *Grand Rapids Castings Co.*
P. Groustra, District Mgr., *Link-Belt Co.*
R. W. Hathaway, Gen. Mgr., *Stillman Foundry Co.*
Samuel G. MacNeill, Met., *Nugent Sand Co., Inc.*
Bernard McCambridge, Gen. Mgr., *Moore Plow & Implement Co.*
Stuart B. Padnos, Secy., *Louis Padnos Iron & Metal Co.*
Guy S. Wells, Supv., Heat Treat. & Welding, *Lakey Foundry & Machine Co.*

Western New York Chapter

John F. Collins, Met. Engr., *Electro-Metallurgical Co., a Division of Union Carbide & Carbon Corp.*
Robert C. Markell, Foundry Engr., *Clark Bros. Co., Inc.*

Wisconsin Chapter

William M. Baird, Jr., Trainee, *Grede Foundries, Inc.*
Arthur C. Buesing, Sales Engr., *Modern Equipment Co.*
Clyde R. Ethier, Met. Engr., *George M. Pendergast & Co.*
Otto Gebauer, *Ampco Metal, Inc.*
Edward H. Jagmin, Jr., Fdry. Engr., *Ampco Metal, Inc.*
J. A. Johnson, Core Rm. Gen. Fmn., *International Harvester Co.*
Stanley George Lipinski, Plant Engr. & Supt. of Cl. Rm., *Pelton Steel Casting Co.*
Paul J. Phelps, Prod. Chaser, *Grede Foundries, Inc., Milwaukee Steel Div.*
James T. Petrakis, Gen. Fmn., Melting Dept., *J. I. Case Co.*
Nathan N. Petuck, Fdy. Fmn., *Grede Foundries, Inc., Milwaukee Steel Div.*
Thad T. Rick, Met., *Allis-Chalmers Mfg. Co.*
Carl J. Risney, Partner, *Risney Foundry & Equipment Co.*
Carl Schwetz, *Thiem Products, Inc.*
Glenn Smith, *Thiem Products, Inc.*
Francis Stanley Tatera, Employment Mgr., *Grede Foundries, Inc.*
Paul A. Thelen, Melt. Fmn., *Ampco Metal, Inc.*

Student Chapters

M.I.T.

Russell A. Chihoski
Swraj Paul

continued on page 126

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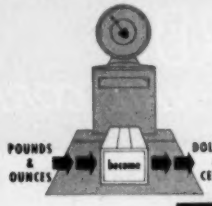

TOLEDO®

HEADQUARTERS FOR SCALES

AFS Introduces

continued from page 124

Michigan State College

Philip Taylor Wright

Oregon State College

Milton Grassell
John Kelley
Donald Van Peybrock
David Buford Schnebly

Pennsylvania State College

Leon L. Gruber

Brooklyn Polytechnic Institute

George Arkwright Jr.
Edward Carcaci
Frank A. Kimpel
Franklin Leung
Per L. Naess
Peter C. Paranicas
Andrew M. Schneider
John Benson
Richard Casagrande
Joseph D. Chodrow
Seymour Levy
John C. Neesham Jr.
Emil Rogner
Biagio Spinelli
Gerald Wm. Bennett
Louis A. Honig
Walter C. Lewis
Ralph W. Mollerick
Stephen Pappas
Jerome Sadofsky
Robert Whalen

Texas A. & M.

Melvin E. Duke
Octavio Eugenio Flores
William Irvin Robinson
Robert E. Evans
H. P. Gayden
J. L. Fincher Jr.
Julius Burt Lovell

University of Alabama

Ed Blackwood
Woodfin G. Mitchell

Outside of Chapter

Mauritz Backstrom M.S. Chem. Engrg., *(Lokomo OY, Finland) Washington, Pa.*
H. C. Hoover, Gen. Supt., *Continental Foundry & Machine Co.*
Frederic C. Irving, Jr., Supt., *Aluminum Co. of America, Bridgeport, Conn.*

International

Chile

Julio Diestre H., Student, *Univ. Tecnia Federico Santa Maria, Valparaiso, Chile.*

Columbia

Alfonso Penagos, Ing. Civil Y de Minas, *Penagos Hermanos, Bucaramanga, Columbia.*

Denmark

Werner Skou Thomsen, Fdy. Mgr., *Amager Jerstoberi, Copenhagen, Denmark.*

England

Messrs. Birlec, Ltd., *Birmingham, England.*

coming events

May

16 . . Texas
Ben Milam Hotel, Houston. Annual Business Meeting—election of officers.

16 . . Central New York
Hotel Onondaga, Syracuse, N. Y. E. S. Bowers, Monsanto Chemical Co. *"Shell Molding."*

16 . . Ontario
Royal York Hotel, Toronto. Annual Meeting and entertainment.

19 . . Central Indiana
Athenaeum Turners, Indianapolis. George Anselman, Beloit Foundry Co., Beloit, Wis. *"Molding & Core Sands."*

19 . . Quad City
Fort Armstrong Hotel, Rock Island, Ill. Lawrence D. Pridmore, International Molding Machine Co., La Grange Park, Ill. *"Core and Mold Blowing."*

20 . . Eastern New York
Circle Inn, Lathams, N. Y. Ralph L. Lee, General Motors Corp., Detroit. *"Man to Man on the Job."*

22-24 . . Amer. Soc. for Quality Control
Onondaga County War Memorial Auditorium, Syracuse, N. Y. Sixth Annual Convention.

23 . . Northern California
Hotel Shattuck, Berkeley, Calif. Casting Defects Clinic.

23 . . Chesapeake
Engineers Club, Baltimore, Md. H. Bogart, Ford Motor Co., Dearborn, Mich. *"Foundry Developments at Home and Abroad."*

23 . . Tennessee
Hotel Patten, Chattanooga. Business meeting and election of officers and directors.

26 . . N. W. Pennsylvania
Moose Club, Erie, Pa. Father and Son Night.

June

5-7 . . Electric Metal Makers Guild
French Lick Springs Hotel, French Lick, Indiana. Twentieth Annual Meeting.

10-13 . . Institute of British Foundrymen
Buxton & Sheffield. Annual Conference.

14 . . Toledo
Adams Conservation Club, King Road near Toledo, Ohio. Annual picnic.

16-17 . . Malleable Founders' Society
Homestead Hotel, Hot Springs, Va. Annual Meeting.

23-27 . . Am. Soc. for Testing Materials
New York. Annual Meeting.

August

11-13 . . Sand School
Engineering Society, Detroit. To be conducted by the Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich. Write for reservations.

continued on page 129

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coming events

continued from page 127

September

8-10 . . American Standards Association
Museum of Science & Industry, Chicago. National Standardization Conference.

8-12 . . Instrument Society of America
Annual Meeting, Cleveland.

8-13 . . Molding Materials Program
Sponsored by the Massachusetts Institute of Technology, Cambridge, Mass. *"Chemistry and Mechanics of Molding Materials."*

13 . . Michiana
Plymouth Country Club, Plymouth, Indiana. Annual picnic.

22-23 . . Steel Founders' Society
Homestead, Hot Springs, Va. Fall Meeting.

26-27 . . Ohio Regional Foundry Conference
Ohio State University, Columbus, Ohio. Sponsored by A.F.S. Canton District, Central Ohio, Cincinnati District, Northeastern Ohio and Toledo Chapters and Ohio State Student Chapter.

30-October 3 . . Iron & Steel Exposition
Public Auditorium, Cleveland. Association of Iron and Steel Engineers.

October

16-17 . . Gray Iron Founders' Society
Hotel Cleveland, Cleveland. Annual Meeting.

16-18 . . Foundry Equipment Mfrs. Assn.
The Greenbrier, White Sulphur Springs W. Va. Annual Meeting.

17-18 . . Michigan Regional Fdy. Conf.
University of Michigan, Ann Arbor, Sponsored by AFS Central Michigan, Western Michigan, Detroit and Saginaw Valley Chapters and AFS Michigan State and University of Michigan Student Chapters.

20-24 . . American Society for Metals
Philadelphia National Metal Congress and Exposition.

24-25 . . Northwest Regional Fdy. Conf.
Multnomah Hotel, Portland, Oregon. Sponsored by the Oregon, Washington, and British Columbia Chapters and the Oregon State College Student Chapter.

November

6-7 . . All Canadian Fdy. Conference
Mount Royal Hotel, Montreal, Quebec Sponsored by A.F.S. Eastern Canada and Ontario Chapters.

10-12 . . National Foundry Association
Edgewater Beach Hotel, Chicago. Annual Meeting.

13-14 . . Southwest Regional Fdy. Conf.
Hotel Baker, Dallas, Texas. Sponsored by AFS Texas and Tri-State Chapters and Texas A & M Student Chapters.

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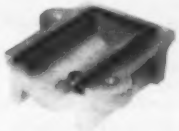

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A.F.S. Publications

	Publication Number	A.F.S. Members	Non-Members
Books			
Alloy Cast Irons Handbook (2nd Edition)	1	$2.75	$4.50
Analysis of Casting Defects	3	2.50	4.25
Cupola Operations Handbook	7	6.00	10.00
Development of Metal Castings Industry	8	3.00	6.00
Foundry Core Practice (2nd Edition)	38	6.50	10.00
Foundry Sand Handbook (6th Edition)	12	3.50	5.25
Foundry Work	50	1.76	1.76
Recommended Practices for Sand Casting Aluminum & Magnesium Alloys	24	1.00	1.75
Recommended Practices for Sand Casting Non-Ferrous Alloys	25	2.25	4.00
Symposia			
Foundry Dust Control	10	1.00	2.00
Graphitization of White Cast Iron	15	2.25	4.00
Malleable Foundry Sand and Core Practice	16	2.00	3.25
Sand Test Data for Production of Steel Castings	47	3.00	4.75
Symposium on Principles of Gating (Available June, 1952)	56		
Foundry cost booklets			
Classification of Foundry Cost Factors	6	1.00	2.00
Foundry Cost Methods	9	1.50	3.00
Recommended practices—safety and hygiene			
Fundamentals of Design, Construction and Maintenance of Exhaust Systems	19	3.00	5.00
Good Practices for Metal Cleaning Sanitation	20	1.25	2.25
Grinding, Polishing and Buffing Equipment Sanitation	22	.75	.75
Industrial Housekeeping and Sanitation	23	1.00	2.00
Safety Practice for Protection of Workers in Foundries	21	1.25	2.25
Testing and Measuring Air Flow	26	1.00	2.00
Annual Transactions			
Volume 53—1945	30	4.00	15.00
Volume 54—1946	31	4.00	15.00
Volume 55—1947	32	4.00	15.00
Volume 57—1949	33	8.00	15.00
Volume 59—1951	48	8.00	15.00
Index to AFS Transactions (1930-1940)	36	1.00	2.00
Education			
Apprentice Training Standards for the Foundry Industry	29	1.00	2.00
Foundry Apprentice Course Outline	39	1.00	2.00
Guide for Foremen Training Conferences	34	1.50	2.25
A. F. S. research progress reports			
Aluminum and Magnesium—A Study of the Principles of Gating	54	1.00	1.50
Brass and Bronze—Melt Quality and Fracture Characteristics of 85-5-5-5	55	1.00	1.50
Gray Iron—Risering of Gray Iron Castings—Report No. 1	42	1.00	2.00
Gray Iron—Risering of Gray Iron Castings—Report No. 2	43	1.00	2.00
Malleable—Surface Hardening of Pearlitic Malleable Irons	52	.40	.60
Steel—Steel Sands at Elevated Temperatures (Tenth)	53	.40	.60
A. F. S. special publications			
Bibliography of Centrifugal Casting	35	1.50	2.25
Cupola Research Committee Reports	49	1.00	1.50
Engineering Properties of Cast Iron	46	2.25	3.50
85-5-5-5 Test Bar Design (Fourth Annual Lecture—1946)	37	1.00	2.00
Gating Terminology Chart (Discount on Quantity Lots)		.10	.25
Graphite Classification Chart (25 x 38 in.)	44	1.25	1.75
Pattern Standard Color Chart (Discount on Quantity Lots)	35	.10	.25
Permanent Mold Castings Bibliography	18	1.50	3.00
Other publications			
Aluminum Foundry Process Control (SAE)	2	1.00	2.50
Ferrous Foundry Process Control (SAE)	11	1.50	2.50
Gates and Risers for Castings (Penton Pub. Co.)	40	6.00	6.00
Non-Ferrous Melting Practice (AIME)	41	3.00	3.50

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chapter news

continued from page 123

are frequently cleaned and coated with a refractory wash.

However, he added, where magnesium is being melted steel pots are very satisfactory. Especially long life can be given a steel pot for melting magnesium by metallizing the exterior with aluminum. Careful and continuous inspection of pots for melting magnesium was stressed by the speaker as a means of preventing costly and dangerous failures.

Mr. Brown then discussed furnace charging, melting of aluminum and magnesium, and the handling and pouring of these metals, with special attention to the use of fluxes and consequent control of gas and dross.

Missouri School of Mines

JACK H. THOMPSON
Chapter Reporter

Triple feature April meeting program provided a full evening of education, entertainment and politics. The politics were, of course, confined to nominations for Student Chapter officers for next year.

Dr. Schlechten, Metallurgical Department chairman, announced the two students chosen to represent the M.S.M. Student Chapter at the National A.F.S. convention. They are Jack Thompson and Jack Wheeler. These men were sponsored by the St. Louis District Chapter and attended the convention with expenses paid.

Charles Esgar, staff assistant, Foundry Educational Foundation, Cleveland, spoke on reasons why F.E.F. was organized and gave a short history of that organization.

Following Mr. Esgar's talk, Henry Meyer, General Steel Castings Co., presented a film on sand and core room operation, entitled "*The A-D-M of Cores*". After the film Mr. Meyer held a question and answer session.

St. Louis District

NORMAN L. PEUKERT
Carondelet Foundry Co.

Subject of the March 13 meeting was "*Nondestructive Testing of Castings*," with C. D. Moriarty, General Electric Co., Schenectady, N. Y., as speaker.

Mr. Moriarty's talk dealt mainly with nondestructive testing of forgings and castings used in the manufacturing of turbines. The speaker stressed ultrasonic testing, which doesn't have the publicity, wide use or same acceptance as x-ray. However, General Electric Co. has accepted ultrasonic testing as its chief nondestructive test in its turbine division. Most parts undergo sonic testing prior to x-ray. The speed and coverage of sonic testing is amazing, he said.

One point brought out by the speaker is the flexibility of sonic testing. Parts in some cases may be tested right on the machine by replacing the tool with a sonic pickup. Ultrasonic has picked up as many as 50,000 cracks which could not be seen by visual inspection in one forging.

Mr. Moriarty made the statement that they never obtain a perfect steel casting in the turbine department, but qualified his statement by admitting the standards necessary are very high.

In closing, the speaker predicted a wider use of ultrasonic testing and a corresponding decrease in the price of the equipment.

Winners in St. Louis District Chapter's Annual Apprentice Contest this year are:

Gray Iron Molding: first, Elmer F. Hemmer, Jr., Excelsior Foundry Co.; second, Paul Sexton, Semi-Steel Casting Co. *Non-Ferrous Molding:* first, Allen Franke, Modern Brass Co. *Metal Patternmaking:* first, John Burkholder, Central Pattern Co.; second, Robert Mahoney, Consolidated Pattern & Mfg.

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SAVES LABOR — CUTS REJECTS
LOWER COSTS — BETTER CASTINGS — MORE CUSTOMERS
THE MODERN MOISTUREPROOF CORE AND MOLD SURFACE CONDITIONER FOR
GREEN OR DRY SAND CORES & MOLDS — MATCHPLATES — CHILLS, INSERTS AND SPRUES

PARASPRAY is a scientifically prepared, ready-to-use, fast-drying, liquid chemical formulation designed for easy and quick application to molds, cores, chills and inserts by spraygun, dipping or brush.

Advantages of Paraspray

- Makes smoother castings and saves cleaning labor.
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- Stabilizes moisture content.
- No baking — no torching.
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- Cuts porosity and gas hole losses — denser castings.
- Produces hard, dry, moisture-proof surfaces with uniform strength.
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- Prevents surface oxidation.

Why Paraspray Is Different

- PARASPRAY, basically a waterproof cement, quickly and tightly *BINDS* together loose grains of sand on the surface of cores and molds.
- PARASPRAY fills a necessary requirement in *MOLD ATMOSPHERE CONTROL*. It completely gasifies at about 400° F. leaving a thin film of amorphous carbon. The inert gas formed replaces *AIR* in mold cavity, providing *A DE-OXIDIZED ATMOSPHERE* which prevents oxidation of surface of molten metal.
- PARASPRAY provides complete moisture control. *A PARASPRAY* film on surface and core or mold *PREVENTS MOISTURE* absorption or loss from molds in green sand work; especially where synthetic sands are used.
- PARASPRAY is the ideal carrier for graphite, silica, mica, zircon flour and other materials used as core and mold surfacing agents to produce smoother castings.

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Co.; third, Elwood Hey, Progressive Pattern Co. *Wood Patternmaking:* first, William Zimmer, Arnette Pattern Co.; second, Raymond Rostrup, Consolidated Pattern Co.; third, Merle Griener, Remmers Pattern Co.; fourth, Rudolph Schmidt, Progressive Pattern Co.; fifth, William Wachter, American Steel Foundries; and sixth, Gilbert Engle, Jr., American Steel Foundries.

Western New York

MARVE TAUBLIEB
Frederic B. Stevens, Inc.

March meeting drew a capacity attendance to hear an informative talk on *"Shell Molding"* by Richard Herold, The Borden Co., New York.

Mr. Herold, instead of dwelling on the fundamentals of the process, developed and brought forward the latest methods and theories involving curing shells and assembly of shells for pouring. The practice of assembling with clamps, etc. and the ensuing disadvantages of "backing up" with shot are, according to Mr. Herold, giving way to faster assembly methods by the use of adhesives that are presently being produced specifically for the assembly of shells.

Mr. Herold discussed in detail the simple and inexpensive basic equipment needed to explore the possibilities of production of castings by the "C Process". The technical discussion following the talk gave evidence that some of these suggestions will undoubtedly stimulate new efforts in this increasingly popular process.

Twin City

J. D. JOHNSON
Archer-Daniels-Midland Co.

March meeting centered around a talk by Clyde A. Sanders, American Colloid Co., Chicago, on the *"Effect of*

Headliners at Chicago Chapter's recent nine-day Melting School held at the University of Illinois, Navy Pier Branch, Chicago, in March were Prof. Roy W. Schroeder (left) and Dean Frederick W. Trezise of the University's Mechanical Engineering Department, Navy Pier.

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MANHATTAN REINFORCED CUT-OFF WHEELS

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Mold Materials on Metals Shrinkage."

Mr. Sanders' talk was based on discussion of a 15-minute film taken of research undertaken recently by Mr. Sanders and his associates at Michigan State College.

Most significant factors in stabilizing mold wall movement are (1) reduce water content, (2) switch from western to southern bentonite, (3) switch from southern bentonite to fire clay, (4) add a cellulose material such as wood flour, and (5) add more seacoal.

Two round table discussions were held concurrently—one on refractory problems, with Edward Oldfield. Minneapolis-Moline Mfg. Co.—and the other on alloying agents for cast iron, with Richard Wilson, American Hoist & Derrick Co., as moderator.

Central Ohio

WILFRED H. WHITE
Jackson Iron & Steel Co.

March 10 meeting, held at the Seneca Hotel, Columbus, opened with a coffee talk by Richard Anderson of Battelle Memorial Institute on *"Gold Mining in Africa,"* in which Mr. Anderson gave a humorous narrative of his experiences on the Dark Continent.

Following this, Howard Ramsey, Foundry Products Div., Archer-Daniels-Midland Co., Cleveland, narrated the sound-color film, *"The A-D-M of Cores."* The film was made in Studebaker Corp.'s new foundry at South Bend, Ind.

The film covered mechanics of mixing sand, cereal, oil and water, as well as sand handling methods. The film started a lively discussion on making cores by the most economical method.

BETTER CASTINGS!
For good, sound castings free from pinholes, and shrinkage cracks, keep close control of your molten metal temperatures! Check the temperature of every melt frequently with Marshall Enclosed-Tip Thermocouples.
Use of Marshall Thermocouples will enable you to pour all melts at definite, correct temperature. Underheating and overheating of metals, and misruns and cold shuts, are prevented. Castings also have better finish, require less cleaning.
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Saginaw Valley

ROY S. DAHMER
Eaton Mfg. Co.

Annual Education Series for high school and trade school students was held on Thursday evenings during the month of March. Arthur Karpicke, Central Foundry Division, General Motors Corporation, served as general chairman. Approximately 300 students and their instructors were enrolled for the four meetings.

First meeting was held March 6 at North Intermediate School in Saginaw. Mr. Karpicke welcomed the students and introduced A.F.S. National Vice-President Elect Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., who spoke on *"Opportunities for High School and College Graduates in the Foundry Industry.*

He discussed the early history of founding and described the principles involved in making metal castings.

After discussing the opportunities in the foundry industry, Mr. Carter explained functions of the Foundry Educational Foundation and told how college scholarships can be obtained.

A Purdue University film showing the molding and casting of a small cylinder block was presented and narrated by James McDonald, Central Foundry Division, General Motors Corp.

A second meeting was held March 13 at Central Junior High School in Saginaw. William Ball, III, of Harry W. Dietert Co., spoke on *"Sand—Its Importance to the Foundry"*, in which he explained the necessity of having sand control in the production foundry and demonstrated various sand tests with the assistance of Don Brewster of the same company.

The third meeting consisted of a plant visitation to the Foundry Division of Eaton Manufacturing Co. at Vassar, Mich., March 20. The students were shown the entire permanent mold process, step by step, beginning with the making of molds and ending with inspected castings. Foundry executives and personnel conducted the students in small groups and described each operation and the operation of the equipment. Students were encouraged to write their questions on paper.

A panel discussion, based on writ-

ten questions from the plant visitation, was held at Central Junior High School in Saginaw, on March 27. The Eaton Manufacturing Co. panel consisted of Howard McClelland, Woodrow Holden, George Fry. At the conclusion of the discussion, the film, "*Men and Molds*," produced by the Lynchburg Foundry Co., Lynchburg, Va., was shown.

Central Michigan

RICHARD H. DOBBINS
Albion Malleable Iron Co.

March meeting, designated "*International Night*," after a brief business meeting, opened with a talk by A.F.S. National Director Harry W. Dietert, Harry W. Dietert Co., Detroit, on "*The Place of A.F.S. in Industry.*" Mr. Dietert also gave an informal preview of the 1952 International Foundry Congress & Show.

Technical Chairman C. C. Sigerfoos, Michigan State College, introduced the evening's speaker, C. T. Greenidge, Battelle Memorial Institute, Columbus.

Mr. Greenidge explained Battelle's various functions and told of the many research projects underway there, including the A.F.S. Aluminum & Magnesium Division's Research Project that has produced three films on the gating of castings and metal flow. This research he said, has subsequently proved invaluable to all foundries.

Other Organizations

CONNECTICUT NON-FERROUS FOUNDRYMEN'S ASSN.
John V. McCarthy

February 20 meeting speaker Norman H. Rossbach gave a talk based on the report of the British Brassfoundry Productivity Team that visited U.S. foundries from New York to Milwaukee two years ago.

The report compared American and British production methods, crediting U.S. productivity to greater incentive, closer relationship between management and employees, standardization, maximum use of mechanical aids, quality patterns and coreboxes, and willingness to try new methods, Mr. Rossbach said.

READING FOUNDRYMEN'S ASSOCIATION
W. J. Cassidy, Secretary

Linings for the basic cupola were described by M. W. Demler, Harbison-Walker Refractories Co., Pittsburgh, at the March 18 meeting.

Technical Chairman John M. Robb of Philadelphia introduced the speaker, and George Kissell presided at the meeting, naming a nominating committee to select candidates for election. Nominating committee is headed by Paul Harner and Werner Finster.

In a separate session for non-ferrous men, James W. Woodward, Excelsior Brass Works, Reading, was moderator for a symposium on brass, bronze and aluminum foundry practices.

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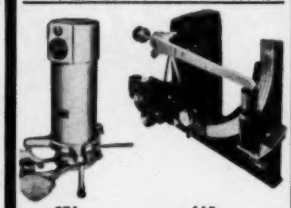
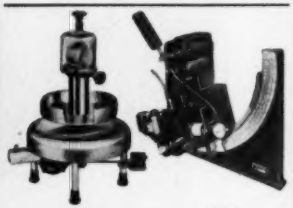
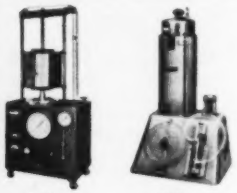
USE THIS EQUIPMENT	 276 665	 621 420A	 785 335
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foundrymen

continued from page 40

Henry T. Heald, chancellor of New York University and a director of American Steel Foundries, Chicago, received the Washington Award on April 21. Award is administered by the Western Society of Engineers, and is an honor conferred "upon a brother engineer by his fellow-engineers for accomplishments which pre-eminently promote the happiness, comfort, and well-being of humanity." **Donald N. Becker,** president of the society, made the presentation.

William R. Bond, vice-president in charge of operations for Lone Star Steel Co., Lone Star, Texas, was named winner of the Johnson Award given by AIMME. Award goes annually to the man under 40 who contributes the most to the technology of making pig iron.

C. D. Galloway, III, authored the article *"Cement-Bonded Molding Sand"* starting on page 67 of this issue. Mr. Galloway worked as foundry engineer for Thomas Devlin Mfg. Co., Burlington,

C. D. Galloway III

N. J., leaving there for his present position as superintendent and plant metallurgist at Chambersburg Engineering Co., Chambersburg, Pa. in 1938. He is currently serving as vice-chairman and program chairman for the Chesapeake Chapter of A.F.S.

George Norwitz, formerly in the Material Laboratory, New York Naval Shipyard, Brooklyn, N. Y., has become a chemist at the Frankford Arsenal, Philadelphia. During the past several years he has been author or co-author of a number of papers on methods of chemical analysis of metals which have appeared in AMERICAN FOUNDRYMAN.

▶Obituaries

William B. Ziegelmueller, 47, died early in April of a heart attack. He was returning from Florida at the time. Mr. Ziegelmueller was vice-president and general manager of Electric Steel Castings Co., Indianapolis. During the 1947-48 term he served as chairman for the Central Indiana Chapter of A.F.S.

Henry Hecht, president of Alloys & Products, Inc., New York, died March 12. He organized the company in 1919 and headed it as president until his death.

Robert E. Chapman, plant superintendent of American Steel Foundries, Granite City, Ill., died March 11 of a heart attack. He was 57 years old. First employed by American Steel Foundries in 1916, Mr. Chapman worked his way up through the cleaning and finishing department, was made that department's general foreman in 1936, and reached his ultimate position in 1941.

Raymond W. Keeny, 64, died February 25 in his home at Olean, N. Y. Mr. Keeny had been associated with Clark Bros. Co., Inc., Olean, for over 30 years, and had been its purchasing agent for many years prior to his death.

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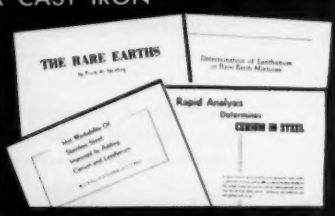

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Shop talk

continued from page 97

mary carbides. In other words, the matrix should be wholly pearlitic.

An unalloyed gray iron can be flame hardened, but usually alloy irons lend themselves better. Nickel-chromium or chromium-molybdenum irons are quite satisfactory, even though they contain but moderate percentages of the alloying elements that improve hardenability and thereby make a less drastic quench necessary to achieve the desired hardness as well as depth of hardening.

Recommended is an iron having a total carbon content of 3.25 to 3.50 per cent, combined carbon of 0.60 to 0.85 per cent, nickel 1.75 to 2.0 per cent, chromium 0.40 to 0.50 per cent; or the same iron alloyed with 0.60 to 0.80 per cent molybdenum and 0.40 to 0.50 chromium.

The silicon content, of course, will have to be controlled, dependent upon which of these two alloy combinations you use and the thickness of section in the casting involved. Use only enough silicon to insure that the casting will be gray throughout. Excess silicon beyond this is undesirable for an iron which is to be flame hardened.

Unless you are wholly familiar with the process and already have the equipment, we would suggest that you contact some of the prominent manufacturers of flame hardening equipment for their recommendations for specific apparatus needed to handle your particular application.

▶Hard foundry floors

We are planning on putting hard floors in our foundry and would like to obtain information on special concretes, paving blocks, and other types of flooring.

In general, most foundries have concrete floors in the molding, cleaning, core rooms. Concrete is about as satisfactory as any material developed, largely because of the fact that it is easy to keep clean and is reasonably durable, only being affected when molten metal is spilled and allowed to remain long enough to transmit enough heat to the surface of the concrete to cause it to spall.

Creosoted wood blocks have been applied in many cleaning rooms and have served moderately well. A

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Arrow tools have a plus quality not found in other tools and hundreds of foundries from Coast to Coast have standardized on them because they give you longer service.

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bituminous type of flooring has also been applied in cleaning rooms, but we are not certain how satisfactory it will be over a long period.

▶ *Machining tolerances*

We use a single drawing system whereby the machine fitting drawing also serves as the pattern drawing, and during recent months we have placed orders with many new sources of supply for magnesium, aluminum, and steel castings. This factor has caused us a great amount of inconvenience and material loss due to the fact that many concerns do not allow enough material for machining operations while other concerns allow too much material for economical machining.

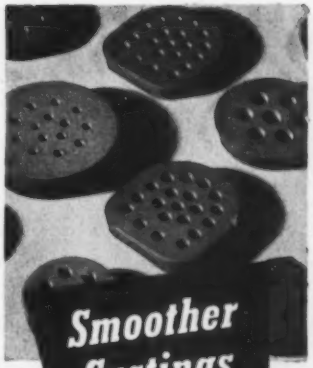
We have searched through various handbooks and manuals in an effort to acquire definite commercial tolerances with respect to machining allowances, but have been unable to find specific information. Where can we obtain this data?

We know of no standard commercial tolerances for castings to allow for machining. This is probably due to the fact that such tolerances are so often dependent upon the design of the casting, its size, the metal from which it is cast, its tendency to warp, and the machining method and set-up.

We believe that such tolerances can best be reached by mutual agreement between purchaser and supplier. When automatic machining set-ups are used, it is preferable to purchase so-called "targeted" castings, which contain locating bosses that automatically align the casting so that when all finished surfaces are automatically machined, adequate metal will be available to make certain that the machined surfaces will clean up.

Under these circumstances, it also becomes apparent that smaller tolerances can be utilized, since the foundry has the obligation of gaging these castings in reference to the locating bosses prior to shipping them to the customer. While targeted castings are somewhat more expensive, the saving in machine time and tool costs will offset the initial cost.

As a guide to machine finish allowances on patterns, page 12 of A.F.S. CAST METALS HANDBOOK contains recommended allowances for finish on cast iron, cast steel, malleable iron, brass and bronze and aluminum alloy castings. We would suggest that you refer to the CAST METALS HANDBOOK for more detailed information.



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It's good business to use AlSiMag Ceramic Strainer Cores—they save you money in several ways. Fit snugly in the gate of the mold to strain the incoming metal—give cleaner castings. Easy to handle—speed production. Easy to store—save valuable foundry space.

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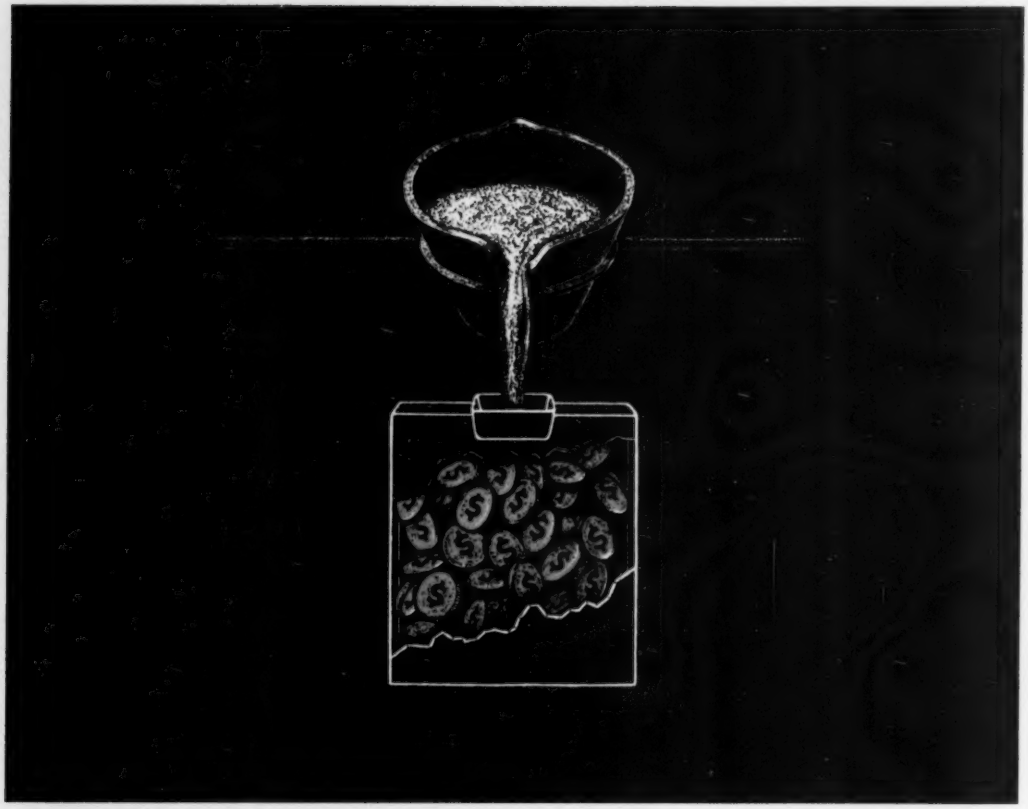

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Using thin-shell molds and cores made of fine-grained sands bonded with BAKELITE Phenolic Resins, the process can be employed for ferrous and nonferrous castings alike. The highly porous molds permit gases to escape easily. Built-in guide pins and holes assure accurate registration, so that allowance for mold shift is unnecessary. Metal surfaces have no burnt-in sand.

Molds and cores can be made in advance and stored for long periods to meet production schedules. They are strong, moisture-resistant, uniform in quality. Light in weight, they are easily handled.

These savings in time, effort, space, sand and metal are well worth considering. To learn more about BAKELITE Phenolic Resins developed for the shell molding process, mail the coupon today.

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foundry tradenews

Pangborn Corp., Hagerstown, Md., is offering a $1000 United States Series E Savings Bond for the best name submitted for its latest model airless blast cleaner. Machine was exhibited at the International Foundry Congress at Atlantic City, N. J., May 1-7. Rules are simple; anyone (except Pangborn employees and employees of its various agencies) can enter. The contest closes on May 24.

Cleco Div. of **Reed Roller Bit Co.,** Houston, Texas, has appointed new distributors for its products. Bristol Metal Working Equipment Co., Hartford, Conn.; S & M Supply Co., Grand Junction, Colo.; and Quinn Welding Supply Center, Chicago Heights, Ill., will handle their areas.

Hampel-Modjeska Laboratories, Chicago, is a newly formed organization to conduct research and development studies, technological and economic evaluations, and consulting. It is temporarily using the facilities of Scientific Control Laboratories, 600 S. Blue Island Ave., Chicago, Ill.

Electro Metallurgical Co., Div. of Union Carbide & Carbon Corp., New York, plans to expand its facilities for producing electrolytic manganese at its Marietta, Ohio, plant. A sixth electric furnace is already in operation, with eight more being built.

Bohn Aluminum & Brass Corp., Detroit, was awarded the Citation of Meritorious Public Service by the Michigan Dept., American Legion. Award was made for "outstanding services and contributions to Americanism." Bohn won it for its anti-Communism advertising.

Simplicity Engineering Co., Durand, Mich., has completed its new 80 by 220 foot plant addition. The structure will handle extra 40-foot bays as they are needed.

Whiting Corp. of Canada Ltd. and its Niagara Screens & Machine Div. are now in new offices at 185 Eileen Ave., Toronto 9, Ont., Canada.

Electro Metallurgical Co., a division of Union Carbide & Carbon Corp., has set up its local district sales staff at 2770 Leonis Blvd., Los Angeles (Vernon) 58. Credit and accounting stay at the old location.

Lone Star Steel Co., Lone Star, Texas, recently received a Certificate of Necessity from the DPA authorizing about $40,000,000 in new or expanded production facilities. These include a second blast furnace, additional coke ovens and coal mining operations, and expansion of the ore mining facilities.

Rust Engineering Co., Pittsburgh, has nearly completed construction at the Fairfield, Ala., plant of **Harbison-Walker Refractories Co.** The additional unit will increase production of silica brick by 50 per cent. Field work on the plant was begun in June, 1951.

American Machine & Foundry Co., New York, has closed a deal for the purchase of a majority of the stock of the **Thompson-Bremmer Co.,** Chicago. The Chicago firm becomes a subsidiary of American Machine & Foundry and will operate as part of its General Products Division.

Seattle Chain & Mfg. Co., Seattle, Wash., has changed its name to **Round Seattle Chain Corp.** Company has branches in Portland, Ore., and Bellingham, Wash.

Barber-Colman Co., Rockford, Ill., intends to purchase the principal assets of **Wheelco Instruments Co., Chicago.** Present plans are to continue current operations in Chicago until such time as manufacturing facilities can be gradually transferred to Rockford in an orderly manner.

Olivine Products Corp., New York, has enlarged its field to include the foundry industry and is prepared to supply olivine for use as a molding material.

U. S. Gypsum Co., Chicago, recognized its 50th anniversary with the publication of a book, *Building a Better Tomorrow*, containing historical and up-to-date information on the company, its products, and manufacturing facilities. Well illustrated, the book shows manufacture and application of gypsum products to foundry, patternmaking, die manufacture, and building construction.

Canadian Car & Foundry Co. Ltd's seven plants in Ontario and Quebec reduced accident frequency during 1951 by 10.9 per cent in spite of a 35.5 per cent increase in man-hours. Marked improvements in frequency shown by three of the plants were Dominion, 32.8 per cent, Longue Pointe 18.8 per cent, and Pte. St. Charles, 46.1 per cent.

Whiting Corp., Harvey, Ill., has issued a 40-page, pocket size handbook for company employees to provide information about the organization's operations and policies. Equally suited to use by new employees as well as old timers, the booklet contains a number of ideas contributed by plant personnel. Cartoons and art work by Richard Knapp, a Whiting employee. Well illustrated and printed in two colors with numerous eye-catching sub-heads, the booklet includes a number of company rules and gives details on pay and hours, company benefits such as profit sharing and bonuses, Whiting history, insurance, health and safety, special services, and recreation.

Hughes Tool Co., Houston, Texas, leads the list in the annual safety records of **Steel Founders' Society of America,** Cleveland. Hughes completed its fourth successive year of accident-free operation. **Quincy Steel Casting Co.,** North Quincy, Mass., and **Weatherly Steel Castings Co.,** Weatherly Pa., each completed its second successive year of operation without a single lost-time accident. The fourth foundry with a perfect record in 1951 was **Eastern Malleable Iron Co.,** Wilmington, Del.

Stanford Research Institute, Stanford, Calif., has issued its 1951 annual report. Typical studies of value to the foundry industry include air pollution, treatment of calcined pyrites, corrosion protection for steel, and infrared sources.

Alloy Casting Institute, Mineola, N. Y., is currently conducting research into the problem of conserving nickel and chromium in heat-resistant castings. Conducted at **Battelle Memorial Institute,** Columbus, Ohio, research has been concentrated on developing a heat-resistant material of lower alloy content than the usual high-nickel alloys frequently used in 900-1400 F service. Alloy selected contains 21 per cent nickel, and is designated HF type. Tests to date are quite promising.

National Association of Cost Accountants, New York Chapter, sponsored the showing of two sound movies as preparation for round table discussion of foundry cost problems on May 7. Films portrayed recent advances in making castings of iron, steel, aluminum, and other metals.

Eastern Malleable Iron Co., Naugatuck, Conn., has published a beautiful example of what can be done in the field of public relations. Their book tells the story of the company, relates its history, and presents facts about properties and manufacture of castings. Example of the skill that went into production of the book is the cover—the title, *Yankee Iron*, is an actual casting recessed flush. Photographs, layout, and organization are all exceptional. Dramatic use of full-color pictures adds much to the presentation. Whole job is brilliantly conceived and executed.

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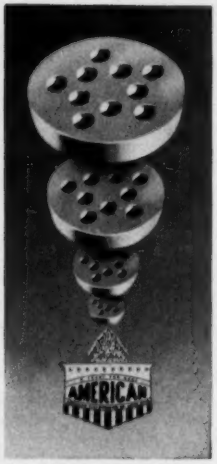

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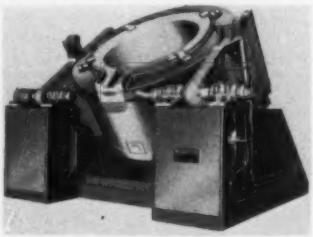
Products . . .

continued from page 17

shows what is not subject to either tax, while the total of all three columns equals the total gross payroll for the week and is automatic proof of the tax figures. *Todd Co.*

507 Melting pot furnace

Used for Kirksite metal, 25,000-lb melting pot furnace has a pot measuring 76 in. in diameter by 37 in. deep. Furnace and pot are tilted by hydraulic cylinders piped



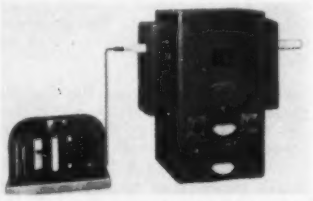
with flow control valves installed in oil lines, allowing adjustment of flow control to give desired tilting speed. Metal is heated by burners mounted below the pot and firing tangentially to the internal lining. Unit may be built for gas, oil, or gas-oil combination firing. *Bellevue Industrial Furnace Co.*

508 Knife resharpener

New knife grinding attachment for 8-in jointer makes it possible to resharpen blades without removing cutterhead from machine. Jointer is furnished with table, drilled and tapped to receive attachment, and proper grinding angle can be obtained by placing pin through stop bar into end of head. Star wheel adjustment and ball crank handle provide any desired position and even, vibrationless guidance. *Delta Power Tool Div., Rockwell Mfg. Co.*

509 Determination of carbon

Self-contained apparatus is designed for gravimetric determinations of carbons by combustion. It is a compact arrangement of throwaway glass cartridges containing reagents commonly used in determining carbon in metals. A single-train model is



available for average use, while a double-train model is used for high production or standby convenience. With the double-train model, two determinations may be made simultaneously. Either model may be used with resistance furnace (as shown in illustration) or with high-frequency furnaces. *Burrell Corp.*

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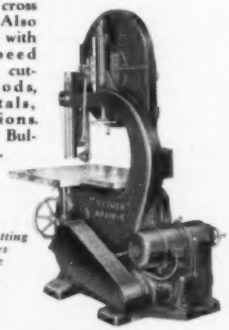
38-inch Metal Cutting
BAND SAW

Has high speed motor for cutting plastics, aluminum and other sheet metals . . . Or with variable low speed motor for cutting heavy cross sections.

A powerful Band Saw — the finest built. Cuts true, steady and smooth. Extra large capacity under guide. Has variable low speed geared head directly connected to lower wheel for cutting light and heavy cross sections. Also furnished with high speed motor for cutting woods, sheet metals, compositions. Write for Bulletin 115-S.



"Oliver" Metal Cutting Band Saws also made in 18", 30", 36" sizes.

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Foundry Information

continued from page 18

520 Metallic abrasives

Featured in "20th Century, The Persuasive Abrasive", an 8-page catalog, is a full line of chilled iron shot and grit, normalized shot and grit, drawn steel cleaning and peening shot, and iron powder. All are made in a number of sizes and special shapes, available on order. Uses, advantages, and proper selection are covered. *Cleveland Metal Abrasive Co.*

521 Shell molding resins

A fast review of the shell molding process is contained in 4-page Bulletin 514F. Raw materials such as resin, sand, and parting agent; mix preparation; such equipment as patterns, the dump box, and ovens; experimental practice; and technical service are all detailed, with illustrations. *Catalin Corp. of America.*

522 Pressure casting units

Matchplates of average size can be produced on the pressure casting equipment detailed in one-page brochure. Equipment will also make aluminum core boxes, as well as loose patterns and precision castings in all non-ferrous metals except magnesium. Complete systems or individual components are offered. *Pressure Cast Products Corp.*

523 Silicone release agents

After a preliminary discussion of the advantages and techniques of shell molding, 5-page Data Sheet MR4 describes a series of three silicone release agents for the process. First is a 35 per cent oil-in-water emulsion; second is a silicone jelly; third is an oil-in-water emulsion containing 40 per cent silicone jelly by weight. Availability, properties, uses, advantages, and limitations of each are presented. *Dow Corning Corp.*

524 Metal removal

Removing excess or defective material from castings is described in 8-page illustrated booklet, "Powder Washing for Metal Removal". Equipment and techniques are discussed for removing fins, pads, sand inclusions, chills, bars, reinforcing nails, and chaplets. Actual foundry applications are shown. *Linde Air Products Co., Union Carbide & Carbon Corp.*

525 Exothermic compound

Two-page folder, "Feedex", covers an exothermic compound which is mixed with water and molded into various shapes—riser sleeves and bushes, pads, necked-down cores, etc.—which are then inserted into molds. The incoming metal ignites the compound, which creates temperatures over 3100 F. Metal can be kept hot for over an hour, thus enabling small risers to feed heavy metal sections and produce sound castings. Folder tells how

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the compound works, how to make a sleeve, and how to use the sleeve; gives physical data and grades; and contains a table of values for typical sleeves. Also available are sheets giving case histories of this compound in casting steel, gray iron, aluminum, tin-bronze, etc. *Foundry Services, Inc.*

526 Dust Collector

Carbon black, cork, fine wood, graphite, lime, soap, metal oxide, and similar dusts are all collected in the cloth-bag dust catcher detailed in 8-page, 2-color Bulletin 914. Illustrated by 12 photos, 7 line drawings, and 2 elevation drawings, the bulletin tells how the collectors work, and how they are installed and maintained. It also gives specifications of standard sizes and dimensions, tells how to inspect and maintain the collector from a walkway between the bags without using tools, and shows how the bags are sealed to the floor with hand knobs. The unique bag construction—with seams forming six tubes having a common opening—is outlined and pictured. In addition, the bulletin describes collector casings, hoppers, valves, and structural supports. An interesting section shows how to mount and flush the collector for various types of disposal—roof, wheel barrow, car, and truck. *Pangborn Corp.*

527 Cupola charges

Four-page Supplement S-147-B shows a truss-type swivel charger in actual operation, gives specifications of small-cone side-discharge buckets, presents a square-top weigh hopper with double doors, and describes a coke and stone loader. Information is concise and well-illustrated. *Modern Equipment Co.*

528 Cut-off wheels

Grade recommendations, performance data, and operating suggestions for Manhattan cut-off wheels used on Stone Machinery Co. equipment are offered in 8-page Bulletin 6921. Also included are photographs of this equipment in action. *Raybestos-Manhattan, Inc.*

529 Bandmachine

Sixteen-page Form 49-201 thoroughly covers the Contour-matic, a hydraulically operated bandtooled machine. Included are illustrations of the types of bandtools designed specifically for this machine. These tools, plus the machine's wide speed range, hydraulic feed table, and coolant system, make it possible to work with materials heretofore considered unmachinable. *DoALL Co.*

530 Storage racks

Twelve-page Bulletin 5221 presents steel storage racks for drums, barrels, crates, bins, skids, and pallets. All are illustrated with installation views. Racks multiply storage capacity of floor space by storing materials to the ceiling. Storage prevents breakage and damage. All stock is visible and accessible. Barrel racks include selective drain racks which permit removal of barrel or drum contents without removing barrel or drum. Skid and pallet racks are also useful for storing crates, cartons, and odd shapes. *Barrett-Cravens Co.*

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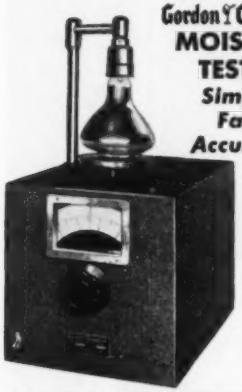

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foundry health

continued from page 72

stated. So is graphite itself, he said, although some types contain free silica which can cause silicosis.

During the non-ferrous sessions, ferrous foundrymen meeting separately heard speakers on sand handling, coremaking and molding, melting and pouring, shakeout and core knockout, casting cleaning, and grinding.

Ferrous dust control

Ray H. Moore, Claude B. Schneible Co., Detroit, discussed sand handling in mechanized foundries and containment of dust created by shakeouts, conveyors, screens and storage bins, mixers, hoppers, and molding machines. He described hoods for shakeouts which collect heavily dust-laden air separately from smoke, fume, and steam, thus reducing dust arresting capacity required. He explained the operation of an exhaust hood which brings in about 80 per cent of the total exhaust requirement from out of doors, reducing heating costs and blanketing the dusty work area.

George Tubich, Michigan Department of Health, covered coremaking and molding problems. Low dust concentrations are generally found in molding areas where good housekeeping is practiced, he said. While momentary high dust counts are measured during use of compressed air for blowing sand of equipment, high concentrations can often be traced to other nearby operations. In general, the same applies to coremaking, but, he warned, core grinding dust requires control.

Carbon monoxide hazard

Melting and pouring create combinations of dust, gas, metal fumes, and excessive temperatures, said John C. Radcliffe, Ford Motor Co., Dearborn, Mich., but in the majority of cases these are of minor consequence or can be controlled economically. He described the use of respirators and local exhaust systems for men tearing down and relining furnaces and cutting refractories with wet and dry saws. Carbon monoxide may concentrate around open cupola charging doors and workmen should be cautioned about resting or eating lunches near them. Metal fumes and gases cre-

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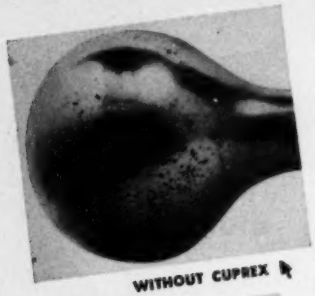

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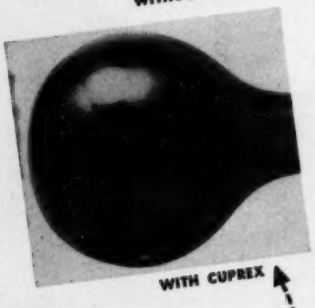

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ated during electric furnace operation can be exhausted by means of commercially available systems, he said.

Control of iron oxide formed during pouring is not normally required, according to Mr. Radcliffe. Acrolein, an eye and upper respiratory irritant created by core oils, along with carbon monoxide developed during pouring should be handled by ventilation, he said. Distance, shielding, and use of salt tablets can do much to protect men from heat, he declared. Fans will not blow away radiant heat, he warned, recommending aluminum shields and aluminum cloth aprons.

John M. Kane, American Air Filter Co., Louisville, Ky., said that centralized shakeout and core knockout is necessary if ventilation is to be economically feasible. Overhead, side, and downdraft hoods (in order of decreasing effectiveness) were described. He illustrated air operated tongs, hydraulic pushers, and automatic dumpers for shakeout in an enclosure with overhead draft. Where flasks require handling by overhead crane, he declared, the side hood has proved reasonably effective, though it requires large volumes of air and cross drafts can interfere with performance. He urged foundrymen not to overlook the ventilation of conveyor tunnels.

Noise control difficult

Kenneth M. Smith presented the paper on control of casting cleaning hazards prepared by Wilbur W. Dodge. Both are with Caterpillar Tractor Co., Peoria, Ill. The speaker reviewed protection against physical hazards through use of goggles, safety shoes and toe guards, gloves, aprons, and helmets. He dealt extensively with the control of dust, fume, and vapor hazards, which he said were most prevalent, perhaps the most costly to control, and the most expensive not to control. He urged a direct approach to problems by looking for causes and curing them. Noise is common in the cleaning room, said Mr. Smith, it is difficult to control, and should be considered from the standpoint of both intensity and frequency.

In discussing grinding of ferrous castings, Kenneth E. Robinson, Michigan Department of Health, Lansing, outlined production of iron dust from the common types of grinders. He described and recommended local exhaust hoods for double horizontal spindle stand grinders

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and cutoff wheels, and booths for swing grinders. For portable grinders, benches with down draft ventilation and floor grills for large castings were recommended. He urged proper design of exhaust systems to keep resistance and blower requirements at a minimum.

At the conclusion of the ferrous and non-ferrous sessions, the two groups met for a final general session with Frank A. Patty presiding. Prof. Flinn summarized the ferrous discussions and Mr. Patty reviewed the non-ferrous papers.

William G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich., presented a management viewpoint on foundry health and safety programs. He described his company's program which has not only saved hands, eyes, and lives, but also has brought insurance down to under 50 cents per $100 of payroll. The average rate in foundries, he said is about $4 per $100 of payroll. The $3.50 per $100 is clear profit which has enabled his company to provide doctors, nurses, complete physical examinations, and periodic checks where deemed necessary or where requested by employees, he declared. Don't buy protection for employees in the form of high insurance rates, urged Mr. Ferrell, provide it in good health and safety programs.

The conference concluded with a presentation of the A.F.S. Safety & Hygiene & Air Pollution program by John A. Radcliffe. He reviewed the early history of A.F.S. and its interest in health and safety which led to the operation of a safety and hygiene program from 1936 to 1944 and the revival of the work starting in 1949. The present 10-year program being carried on for the foundry industry by the Society, he said, is under the direction of a committee of foundrymen representing small and large shops, insurance men, and equipment manufacturers. Funds are being provided by industry, he reported (see page 73, this issue), and it is hoped that every plant will participate in the program inaugurated for the benefit of all.

▶ Popular foundry topics on Penn State regional program

■ Nodular iron, shell molding, and basic cupola practice are on the program of the 8th Biennial ASM Interchapter Meeting to be held at Pennsylvania State College, State College, June 20 and 21. The foundry subjects will be covered at a session the morning of June 21. Session chairman will be Howard F. Taylor, Massachusetts Institute of Technology, Cambridge.

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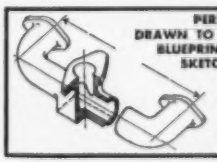


PERSPECTIVES DRAWN TO SCALE FROM BLUEPRINTS OR SHOP SKETCHES — FOR CASTING ANALYSIS
V. L. SHERMAN
[illegible]
PHONE [illegible]

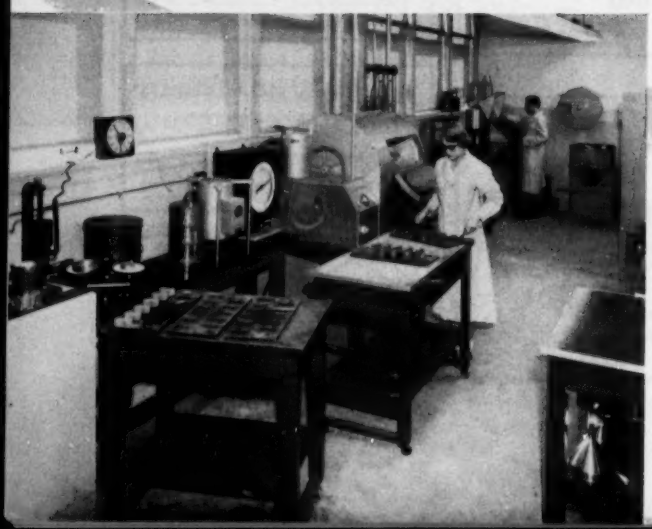
LINOIL

CORE OILS

PRODUCE

Better Cores at Lower Cost

WE PROVE IT



Linoil Research continually examines and evaluates new materials for use in improving core binders. When a material looks promising, it is sent to ARCHER-DANIELS-MIDLAND Sand Laboratories for a thorough observation in all core properties, permeability, flowability, green and baked strength, collapsibility, and many others. Once the new grade of LINOIL has been developed, manufacturing control laboratories in each of the three LINOIL plants make certain that chemical and physical specifications are never varied. No matter what grade of LINOIL you specify, you are assured consistent performance from the best core oil you can buy.

STUDEBAKER PROVES IT

Many automotive foundrymen consider the core room to be the most important department in the foundry. Cores aren't responsible for all the problems of the molding and cleaning departments; but a smoothly operating core room does mean far fewer headaches in the rest of the shop.

Like most automotive foundries, Studebaker uses LINOIL. They find that LINOIL gives them good, useable cores at a low cost. And they know that once careful controls are established on any core job, LINOIL can be depended upon to give uniform results.

YOU CAN PROVE IT

Ask your LINOIL representative to give a demonstration with your core work right in your own foundry. He'll select the grade of LINOIL that's best for your condition, then show you how your cores can be made to do a better job at a lower cost, with LINOIL core oils. And if you've got a particular core problem that's hard to solve, he'll be glad to help you work it out.

Have you heard about the New LINOIL 700 Core Oils?

Here are the facts: No matter what core oil you are now using, you can replace it with one of the newly-developed LINOIL 700 Series and get greater tensile strengths *at a lower cost.* The LINOIL 700 core oils are easy to work with, too. They're proving to be the best core oil buy in the history of the foundry industry. Ask your LINOIL man about the "700 Series"—or write for further information.

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